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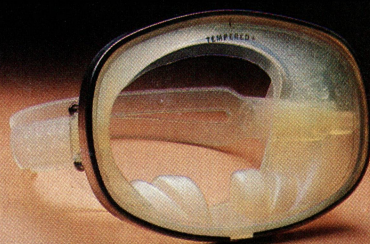
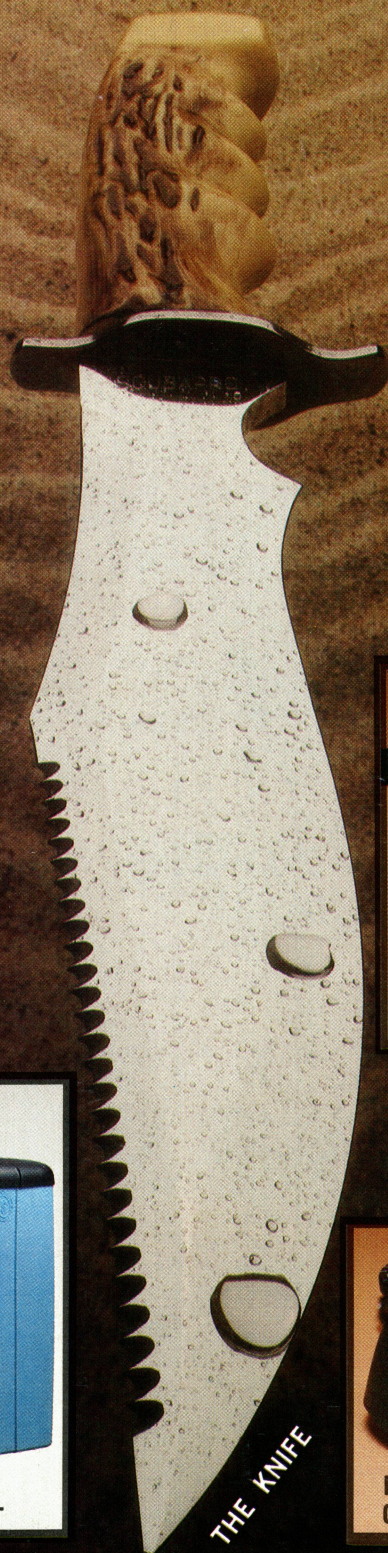
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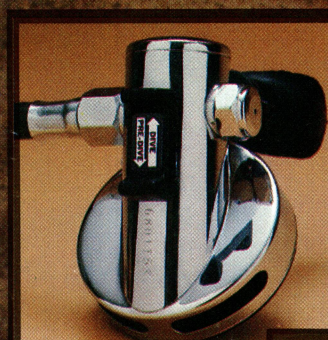
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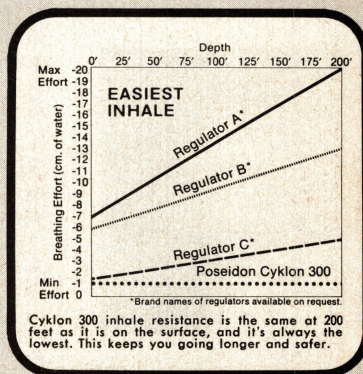
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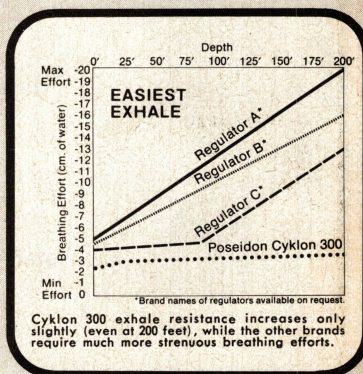
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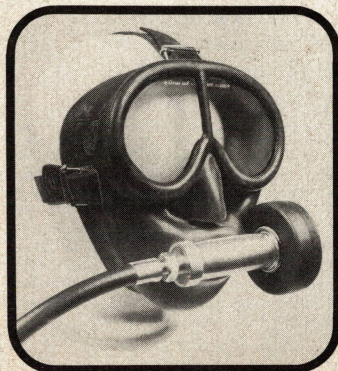
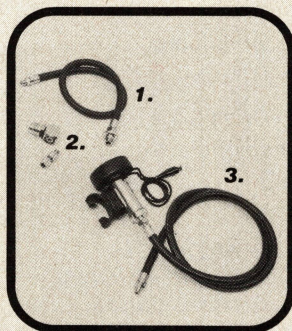
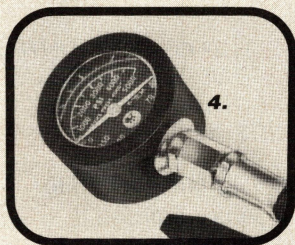
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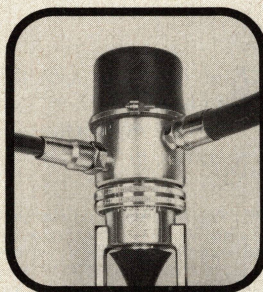
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skin diver

VOLUME TWENTY-FIVE NUMBER TWELVE

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staff PAUL TZIMOULIS Editor-Publisher / CONNIE JOHNSON Managing Editor
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cover

Paul Tzimoulis took this photograph of Dave Inman, owner and operator of Divers Unlimited of Haiti. Inman is taking a close-up photograph of an arrow crab on a tube sponge on Kaloa Reef, five minutes from the Kaloa Beach Hotel. Tzimoulis used a Nikonos III camera with a 15mm Nikonos lens and an Oceanic 2003 strobe.

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24/Groupers



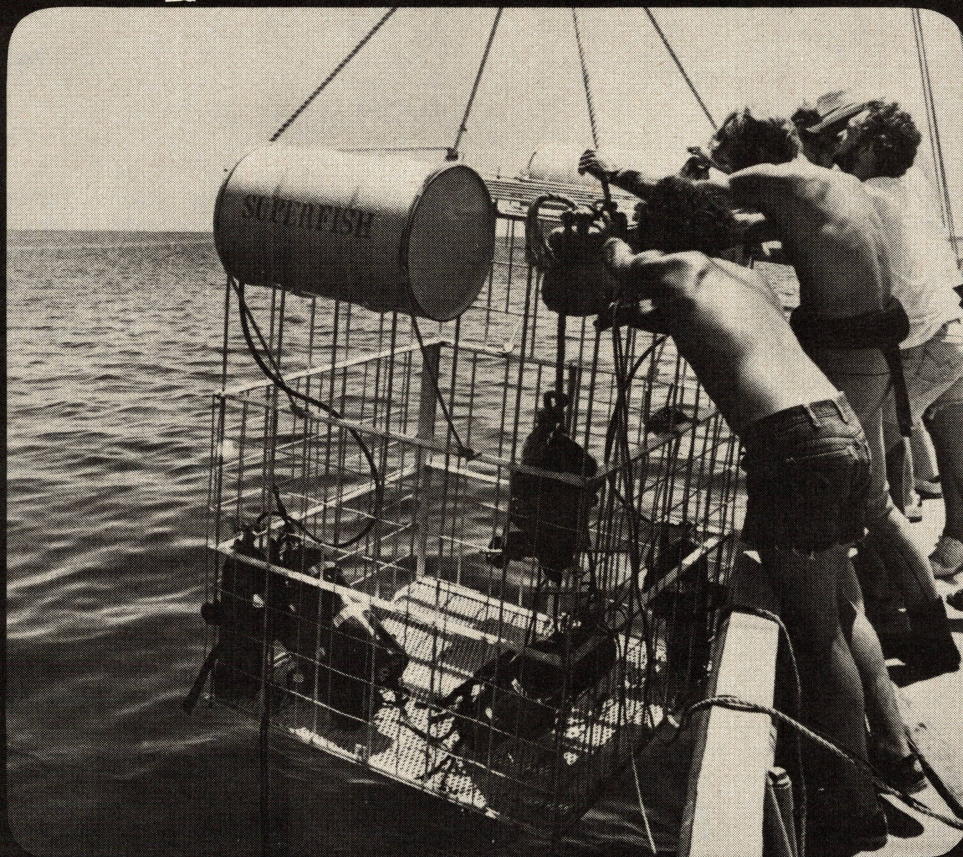
48/Get Close



32/The Alternative



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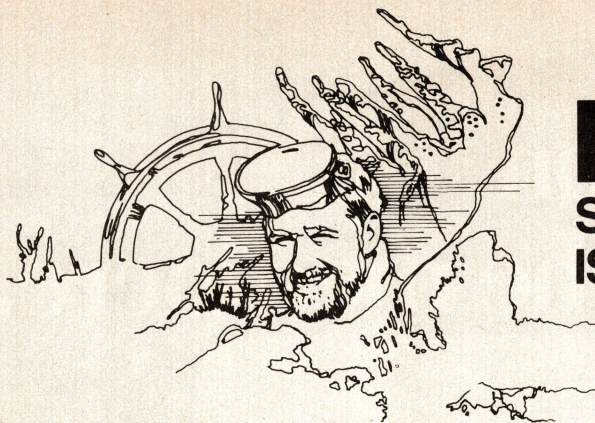
The shark cage above is self-contained, buoyancy controlled and has surface

communications. You might have read about it elsewhere. We could have assigned the design and construction to our faculty. We didn't. Two of our students conceived, constructed and tested the cage as a part of their regular academic program.

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Editorial

SCUBA SAFETY IS EVERYBODY'S BUSINESS

by the Publisher

Sport diving is facing a major crisis. In fact, the problem is so serious that it could cripple our future growth and eventually destroy the sport. The problem affects everyone from the beginner to the 20 year veteran.

The sport has been hit hard by a series of prohibitive laws, restrictive legislation, and discriminatory regulations and increasing insurance rates during the past few years. The Los Angeles Scuba Ordinance cost the diving industry an estimated four million dollars and almost stopped all diving and scuba instruction until it was repealed. Florida state legislators have repeatedly threatened to close all Florida freshwater springs to cave diving or possibly require state licensing and certification. Some springs have actually been closed to divers by local ordinances. The city of Monterey (California) attempted to close its beaches and shoreline to divers and finally settled for a 25¢ surcharge on tank refills. The neighboring city of Carmel has effectively kept divers off its beaches by requiring a \$100 license for scuba checkouts.

Scuba instructor insurance has quadrupled in the last five years, while dive shop and equipment manufacturer insurance rates have spiraled at similar amounts. These heavy increases have been passed along to the consumer in the form of higher and higher prices for instruction, equipment, dive trips, etc. Life insurance for sport divers is almost unobtainable at many insurance companies, and those who offer it often charge exorbitant surcharges.

Why this insanity of discriminatory laws and pricing? It all stems from diving accidents and fatalities. Lawmakers and insurance underwriters regard scuba diving as a strange and hazardous sport. A cluster of diving accidents over a short period of time often panics lawmakers into hasty and irrational laws. Newspaper and political pressures often win out over logic or statistical fact.

Although it may sound unfair, it is the cold hard facts of life. The mistakes and errors of comparatively few ignorant, unskilled, or careless people are resulting in the loss of our freedom to dive. Diving

accidents are driving the prices of equipment and instruction beyond the reach of the average consumer. Diving fatalities are preventing us from obtaining insurance or gaining access to otherwise public beaches. What's the solution? It is obvious — reduce the number of diving accidents and perhaps we can eventually regain lost dive sites and reduce insurance costs.

Who is going to do the job? The legislators cannot solve our problems. It's a known fact that you cannot legislate ignorance or carelessness. In fact, laws often cause more harm than good — as we sadly learned with the Los Angeles Ordinance. The police cannot control or enforce diver safety. They are a land based enforcement group with limited personnel and budgets. The problem lies underwater. The Coast Guard cannot enforce diving safety because of the same limitations. They hardly have enough men available to cope with unsafe boaters and drug smugglers. Who is left who can do the job effectively? You guessed it — you, the individual diver — the person most affected by diving accidents.

Safety is everybody's business and responsibility. Since accidents end up costing us more money and less freedom, we must make an effort to reduce or prevent them. This means a personal commitment on the part of every diver who honestly loves and enjoys this sport. Safety enforcement starts with yourself, making certain you are properly equipped and following all of the prescribed safe diving procedures. Regular equipment maintenance and repair, good physical conditioning, and advance diver training are part of a good safety program.

But self-discipline is not enough — you must watch out for the other guy, also. Even though the diver may be a stranger, he or she should be approached and told what they are doing wrong and how it could result in an accident. Confrontations may sometimes prove awkward or even embarrassing, but the results are worth it. You could help to save a person's life, and in doing so, perhaps save a beach, a sport, and some money.

There are numerous ways in which divers can pull together for a stronger scuba

safety program. For example, dive clubs should take a stronger, more active stand on this issue. Safety equipment requirements and regular tank inspections could become part of club membership renewals. A program for physical conditioning in the pool should be at least as important as planning those weekend dive trips.

Perhaps the greatest contribution a dive club could make would be in developing a scuba safety campaign for the community in general. Weekend beach patrols might help greatly in heading off potential accidents. Advising ill equipped novices of the potential hazards could help save many lives. Many, many accident victims are simply ignorant of the facts or equipment required. They don't deliberately mean to break the safety rules — they just don't know any better. Snow skiers have developed a program for their sport — called the Ski Patrol.

Still another method of promoting scuba safety is the construction of safety signs which could be posted at popular dive site locations. It's another way of getting the point across convincingly. Such signs could provide a convenient check-list for equipment requirements, or perhaps a list of diving's most important do's and don'ts. It would be an excellent project for any dive club or council.

For many years, the diving community has devoted its total energies and concern towards the development of a strong program for basic training and certification. We have done admirably well in this respect, but training is not enough. After awhile people forget what they learned in basic scuba class, or they become lax and overconfident. Scuba safety is a lifelong struggle which requires continuing effort and constant reminders. What we don't need is ineffective laws and regulations which unfairly place an added burden on the shoulders of conscientious safety minded divers.

Remember — only a diver can prevent a diving accident, because he is the only one who can fully recognize those little errors or omissions which can quickly add up to tragedy. Do your part to prevent scuba accidents. 

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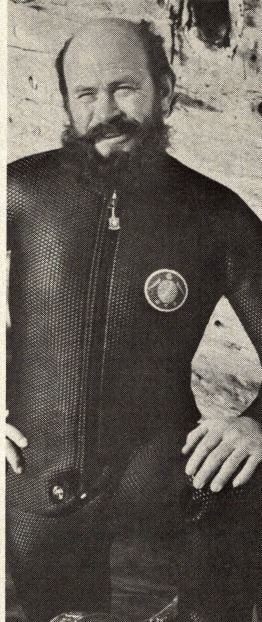
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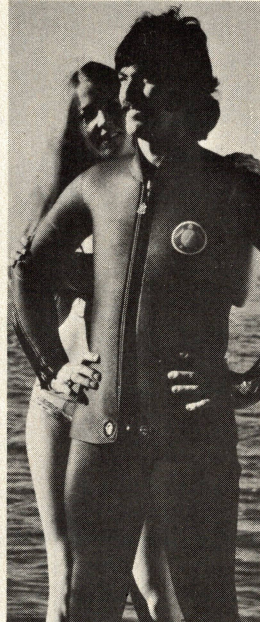
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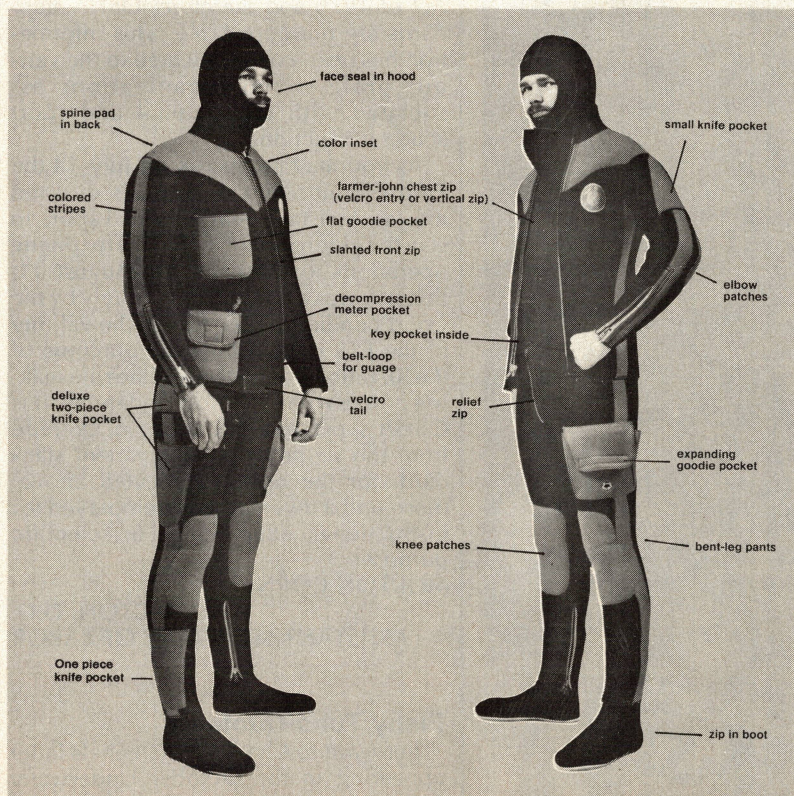
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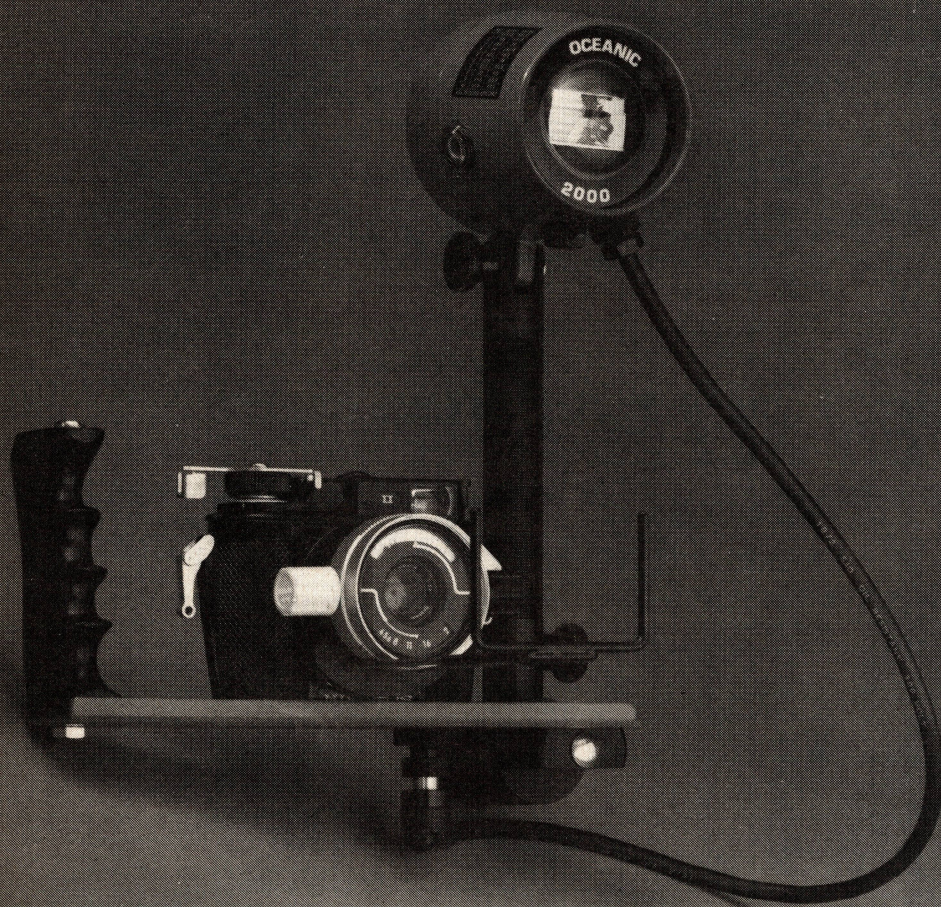
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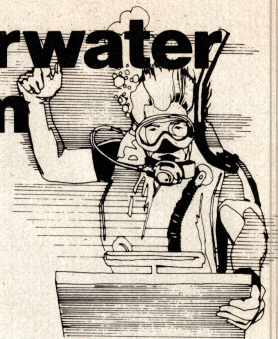
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Underwater Forum



OSHA and ETS

The following letter was received by Ralph B. Shamlian of the National Scuba Advisory Committee.

This is in reference to your inquiry regarding the scope and applicability of the Occupational Safety and Health Administration's (OSHA) Emergency Temporary Standards (ETS) for Diving Operations. The ETS is intended primarily to address the occupational safety and health hazards associated with and related to, commercial diving operations. OSHA recognizes that the working conditions faced by instructors of recreational or sport scuba diving differ from those encountered by commercial diving operations.

For this reason, OSHA has determined that this standard does not apply to underwater instructors and similar personnel who are engaged in the teaching of recreational or sport scuba diving. Furthermore, individuals engaged in recreational or sport scuba diving for their own personal enjoyment, not related to their employment, are outside the jurisdiction of the Occupational Safety and Health Act of 1970 and therefore, OSHA standards are not applicable. This information has been communicated to the various professional organizations associated with recreational and sport scuba instruction.

As you may be aware, on July 14 the Fifth Circuit Court of Appeals directed me, as Assistant Secretary of Labor, to stay the enforcement of the ETS for diving operations for 30 days. On August 11, this stay was extended indefinitely by the Court pending a decision on the validity of the ETS itself. While the outcome of the litigation does not affect the rule making process which is now underway, it is OSHA's present intention to exclude from the scope of the permanent standard, for the reason indicated above, those scuba divers who are employed for instructional, educational, or scientific purposes . . .

MORTON CORN

WASHINGTON, D.C.
ASSISTANT SECRETARY OF LABOR

Fishy Tuna Quota

In regard to Charles H. Greene's letter appearing in the October Underwater Forum.

skin diver

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Underwater Forum

It is true that a federal court did strip the tuna fleets of their purse seine nets. But the Commerce Department has reinstated their use. See the New York Times Sunday, July 4, 1976 Week In Review section, page five, column three:

"... In a dispute between tuna fishermen and environmentalists, the Commerce Department has set a limit of 78,000 on what it calls the 'incidental' killing of porpoises by tuna fleets in 1976. When the limit is reached, nets used by the fishermen will be banned ... The Commerce Department estimates that 134,000 porpoises were killed this way last year."

As the tuna fishermen will police the 78,000 limit themselves, we can be sure the killing of porpoises, in violation of the Marine Mammal Protection Act, will continue unabated. All concerned citizens, most assuredly all in the diving community, should boycott all tuna products.

GEORGE P. SHARRARD
NEW YORK, NEW YORK

... On May 11, 1976 a ruling was issued by U.S. District Court Judge Charles R. Richey that the tuna industry must stop the yearly slaughter of over 100,000 porpoises that die in the purse seines ... set to catch the yellowfin tuna ... The ruling was to go into effect on May 31, but the tuna industry and the Commerce Department appealed the act. They lost the appeal, but they did get a stay until January, 1977 ...

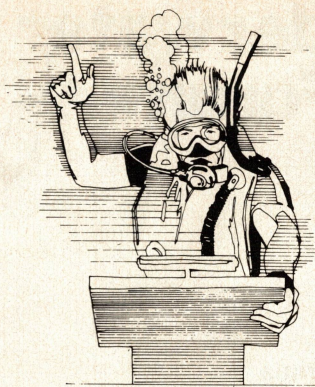
On June 11th the National Marine Fisheries Service set a quota of "only" 78,000 dolphins which the Service would permit the industry to kill. A quota that is unenforceable in as much as ... it is up to the captains to keep the quota. Now that is like leaving a two year old to look after the cookie jar ... something to think about as you are opening your next can of tuna ...

RICKEY L. GOODNER
FORT WORTH, TEXAS

Addendum to Diving Docs

... Please add my name and that of my colleague, Dr. William J. Burchfield, to your List of Diving Doctors.

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CONCORD, N.C.



Dr. Henry's specialty is pediatric and adult urology. His office is at 102 Lake Concord Road, NE, Concord, N.C. 28025. (704) 786-5131 or (704) 786-1717. Dr. William Burchfield's office is at 500 Lake Concord Road, NE, Concord, N.C. 28025. (704) 782-1127.

NAUI Note

The article "NAUI, A Pioneer and Leader," in the October SDM, included a photograph of a diver rescue. This photograph was to illustrate that NAUI conducts vital diver information seminars, such as diver rescue seminars. The photograph captured a moment in a practice rescue and not an actual emergency.

JEANNE BEAR SLEEPER

COLTON, CALIFORNIA

Dive Chamber Research

The News Brief section of the October SDM states that only six chamber complexes exist in the country for civilian manned diving research — one of them being the 1000 foot capability chamber facility at Tarrytown Labs, Ltd. Recently this chamber complex . . . was purchased by the Professional Diving School of New York, City Island, N.Y.

The school is presently using this equipment in its professional deep sea diver course . . .

There exists an agreement between the school and Tarrytown Labs that this facility and associated support equipment will remain available to the lab for manned diving research . . .

TOM SCHMIDT

CITY ISLAND, NEW YORK

Diving in Virginia

In response to SKIN DIVER'S feature on the Shenandoah River, (Sept.) I would like to . . . suggest that the Cacapon River is better for diving purposes than the Shenandoah. Like the Shenandoah, it runs north from near Lost River to the Potomac in West Virginia. To get to the Cacapon, at Cacapon Bridge (W. Va.), take U.S. 50 west from Winchester (Va.) for about 18 miles.

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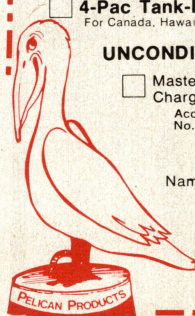
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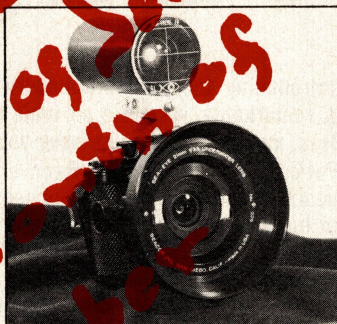




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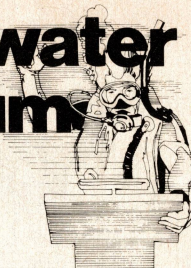
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Underwater Forum



Hypothermia

It is with a great deal of interest that I read Captain Spaur's very fine article on hypothermia, "Heat Loss in Divers," (SDM, October).

As an addendum to the hot bath treatment, I was privileged to hear Martin L. Collis, Ph.D., a director of Canada's "Man in Cold Water Research Program," deliver a recent lecture. Dr. Collis reported his team found that less after drop occurred when hypothermia victims were rewarmed by breathing heated, moistened (to carry more calories) air; thus, rewarming was accomplished from the inside outward.

The publications of this team give much of the same information Captain Spaur did, plus some interesting recommendations for prevention of hypothermia while at the water's surface . . .

RICHARD R. HAKES HURST, TEXAS

Dive Medicine

. . . I am 28 years old and am under a doctor's care for my high blood pressure. I am taking medication . . . and would like to know if any of the medicine would have ill effects while diving. I take Esidrix, Apresoline, and Inderal every day . . .

DONALD E. RIESER

RIVERSIDE, ILLINOIS

It's impossible to answer your question without more complete information, and there are no pamphlets I can suggest. I've known people on blood pressure medicine to dive regularly, without trouble. All three pills can create problems for divers, but if you are well adapted to them, they probably won't for you.

If your hypertension is labile (subject to rapid change on slight provocation), you face several risks. Initial immersion, especially in cold water, can raise your pressure by blood shift and by nerve reflex. Sudden excitement would raise it too. Prolonged immersion might lower it because of volume depletion due to diver's diuresis (excessive urine output).

If your heart is enlarged or you have other complications of hypertension, any major physical stress could be harmful. Discuss the matter with your doctor. If you do dive, make it conservative, and stay with a reliable buddy.

CHARLES V. BROWN, M.D.

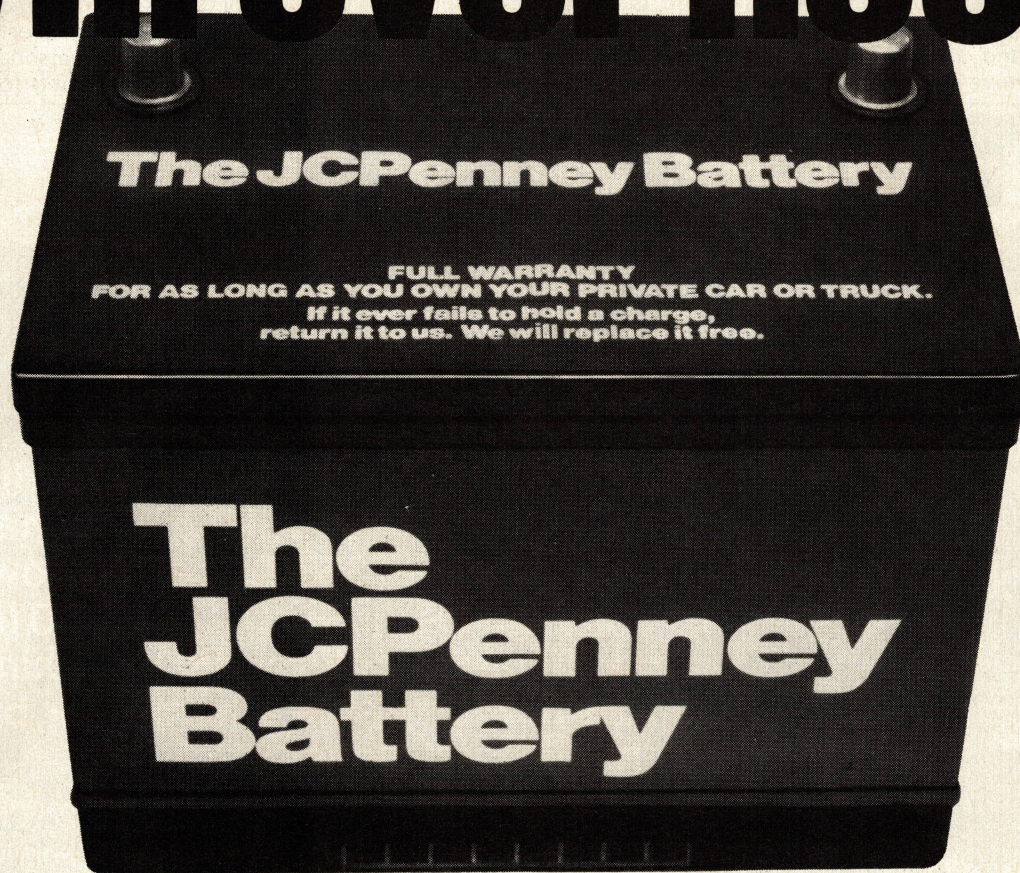
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How To Deal With Seasickness

BY NEAL SCHMIDT, PH.D.

Ask any experienced ship's captain, fisherman or scuba diver for a seasickness remedy and you are bound to get a tried, if not true, answer. If you ask a variety of people, you are certain to receive a variety of cures, for seasickness appears to be one of the most controversial and most frequently faced problems for those working on or under the sea.

Seasickness is classified as a form of motion sickness, a syndrome characterized by pallor, salivation, vomiting, sweating, and prostration. Motion sickness has been identified in people riding vehicles such as planes, ships, trains, and cars. Others develop the symptoms when they move on playground equipment such as swings. Still others acquire motion sickness when they ride on elephants or camels, although horses apparently do not cause the problem. Other species of life are not immune. Dogs get tranquilized for this condition as often as men. Even fish, such as codfish, become seasick after being ashore for awhile and then transported by boat to their point of sale. Scuba divers develop seasickness on the boat ride to their dive site and also down below when the water movement changes their

head and body motion, especially when they are ascending too rapidly.

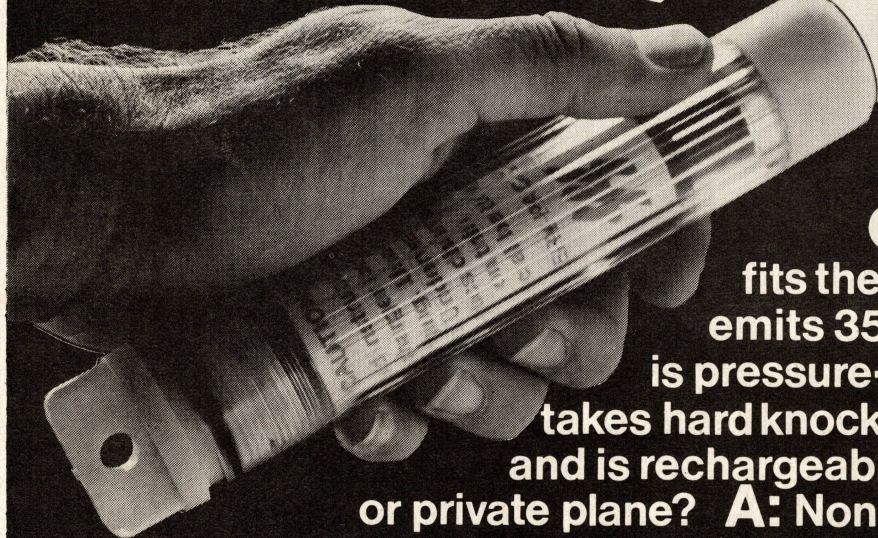
The cause of seasickness, and thus its measurement and evaluation, is not completely understood. There is, in particular, a lack of distinction between the physiological and psychological symptoms and the results of these symptoms on behavior. A major factor appears to be that repeated rolling, pitching, rotating, and upward and downward movement results in labyrinthine stimulation.

The labyrinthine or vestibular apparatus includes the cochlea, vestibule, and semicircular canal or utricle of the inner ear, along with their respective neurons. Research indicates that objective or subjective symptoms of seasickness do not occur unless there is a summated stimulation of the internal ear apparatus. The vestibular cerebellar midbrain "vomiting center" and medullary chemoreceptors are also in some way involved. People whose labyrinths have been destroyed by disease do not suffer from seasickness. When sensory information is discordant within the functional vestibular systems, seasickness is likely to occur. Bodily motion or motion of the visual field as occurs in linear ac-

celeration or deceleration or repeated vertical movements cause seasickness. The motion of a boat usually causes head movements relative to a person's body, with the head and boat moving differently with respect to inertial space. Persons susceptible to motion sickness seem to have great head movements under these conditions. Coriolis accelerations also cause seasickness. This reaction occurs when a person is exposed to rotation at a constant angular velocity and the head is tilted about an axis perpendicular to the axis of the rotating device. The resulting disorientation from the head tilt disturbs the vestibular system. These and similar motions cause labyrinthine stimulation which in turn set up reflexes in the cerebral circulation, the vomiting center, and autonomic nervous centers, resulting in a variety of symptoms.

Another important factor causing seasickness is psychological. Individuals not only react differently than others but also within themselves to the same objective stimulus. Sometimes only a few divers on a tossing boat will get ill. Sometimes a diver will react violently to mild boat movements and this same diver will remain quite healthy at another time under very rough weather conditions. Perhaps a trait of lifestyle permits some people to adapt, or perhaps some people have more control over sensations than others. Types of personalities theorized to be more susceptible to seasickness in-

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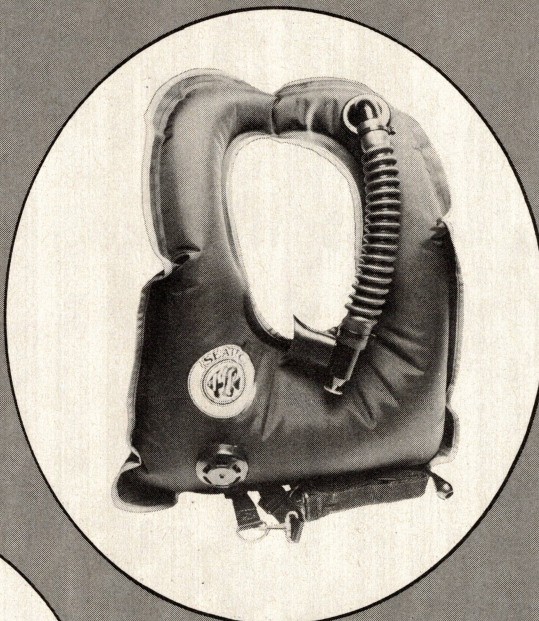
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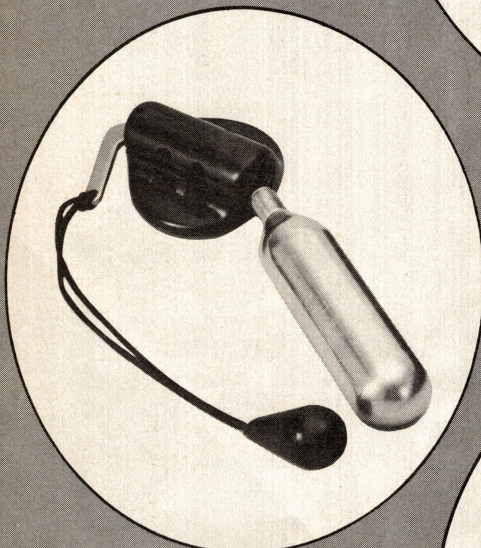
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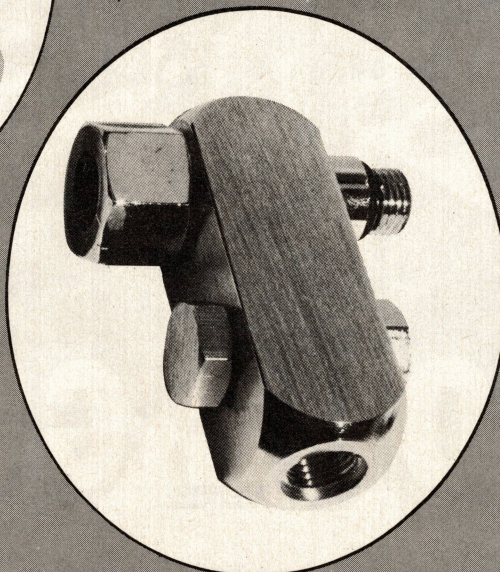
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Seasickness

clude introverts, those who tend to be highly neurotic, and those who have conflicting perceptual inputs. The relationship of personality to seasickness is still debated. Seasickness is more common in children than adults, possibly because of acquiring a tolerance through repeated or continued exposure.

There are two separate variables operating once seasickness develops. The first variable reflects the severity of the sickness, ranging from extreme nausea, vomiting, pallor, and sweating to nothing more than slight paleness. The second variable pertains to the individual's level of performance. Performance, regardless of physiological symptoms, may range from total inability to work, with a severe decrease in perception, judgment and concentration along with depression and apathy, to no effect on performance, change of mood, perception, judgment or concentration. The ability to overcome or cope with seasickness may depend greatly on the psychological makeup.

There are other factors which appear related to seasickness and could very well be a combination of physiological and psychological disturbances. These include anxiety, visual stimuli, unpleasant odors or sights, visceral sensations of motion, diet, sudden change in body temperature, and poor physical condition due to disease or infection.

Besides the predominance of nausea, vomiting, pallor and sweating, there are many other signs of seasickness. There may be increased salivation, cold, clammy extremities, shallow breathing, a fall in systolic blood pressure of from 1 to 30 mm Hg, decreased diameter of the retinal vessels, a faster or slower pulse rate, vertigo, nystagmus, increased muscle blood flow, sighing, yawning, slow respiration rate and shallow breathing or increased respiration, increased swallowing, increased gas or belching, frontal headache, loss of appetite, fall in body temperature, fatigue, and lack of motivation. The aftereffects may last for 24 hours or longer and are characterized by listlessness and mild nausea.

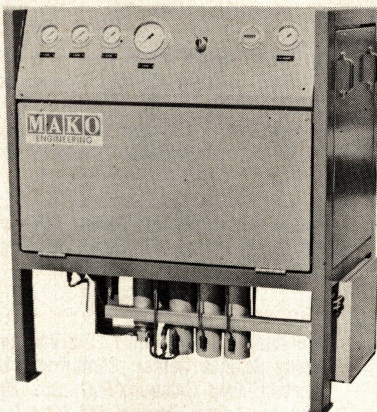
Any agent used to combat seasickness should be administered prophylactically. It is doubtful if this illness can be alleviated once severe nausea or vomiting has occurred. Although avoiding the motion by keeping the feet on solid ground might be the best therapy, there are several other preventive measures that may combat seasickness. Since there are such wide differences in response to preventive measures, individual assessment is essential for maximal benefits. What is best for one person may be ineffective for another under similar circumstances.

DIET — A light, fat free meal should be taken three to four hours before the boat

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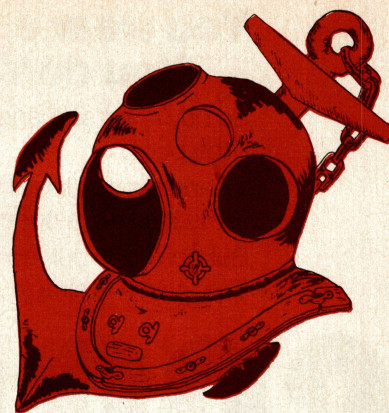
trip. Avoid foods such as eggs, butter, mayonnaise, cheese, greasy products, fatty meats, and gas producing vegetables such as onions, lettuce and beans. Foods easily tolerated by most people include orange juice, oatmeal, granola or whole grain cereals, skimmed milk, and jello. The Russians have been experimenting with vitamin B-6 (pyridoxine) in preventing vestibular disturbances. The best sources of vitamin B-6 are meats such as liver, vegetables such as potatoes, wheat germ and whole grain cereals. Some divers have found that it settles the stomach if just before the trip or between dives they munch on soda or saltine crackers, or eat a piece of fruit such as a banana or apple.

DRUGS — To be effective, drugs must be taken 30 minutes to an hour before the trip begins. Be sure to follow directions on the container carefully. Seasickness drugs are often divided into groups according to their action on the autonomic nervous system, central nervous system, vascular or antihistaminic. However, very little is actually known concerning the mechanisms by which these drugs reduce seasickness. Some divers find that sodium bicarbonate settles the stomach and prevents seasickness. In recent years, seasickness drug therapy has emphasized two classes of agents: the acetylcholine antagonists such as antihistamines and scopolamine, and H₁ blockers (inhibit effects of histamine on smooth muscle) such as promethazine, dimenhydrinate and cyclizine.

Of the prescription drugs, scopolamine, also known as hyoscine hydrobromide, has been reported as the most effective drug for four to six hour exposure to severe seasickness. An oral dosage of 0.1 mg to 0.6 mg is taken one hour before a trip. The major disadvantage of scopolamine is that it causes sedation. It may also cause dry mouth, blurred vision, and dizziness, but has little effect on motor skills or intelligence. Scopolamine should not be used over a period of days because of severe side effects, such as hallucinations.

Several recent studies have suggested that a combination of prescription drugs may be best. A prescription of amphetamine (10 mg) and scopolamine (0.6 mg) or promethazine (25 mg) has been found to be effective and well tolerated. Promethazine (Phenergan), alone or in combination, appears to be one of the best antihistamines for preventing seasickness. It is administered orally in dosages of 25 to 50 mg and also has an antiemetic action. Side effects, although slight, include sedation, dry mouth and blurred vision. A fixed dose combination of promethazine and ephedrine sulfate (25 mg each) has been reported as exceptionally effective.

Nonprescription oral drugs which are effective for brief exposure to seasick-
(continued on Page 58)



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8th Int'l Conference on U/W Archaeology,
Government Conference Centre &
Chateau Laurier Hotel, Ottawa, Ont.,
Canada (Contact: Jervis D. Swannack,
1600 Liverpool Court, Ottawa, Ont.,
Canada)

January 15

Entry deadline, Illinois Council Photo Con-
test. (Contact: Gary Chesnut, P.O. Box
466, Dekalb, IL 60115)

January 15

4th Inland Divers Association U/W Film
Festival, Tarrant County Convention
Center, Ft. Worth, TX, 7:30 p.m. Entry
deadline Jan. 2 (Contact: Dennis Corcoran,
6313 Greenfield Rd., Ft. Worth, TX)

March 5

Boston Sea Rovers '77, Boston, MA (Con-
tact: Bunky Hodge, 174 Beech St., Rock-
land, MA 02370)

April 16

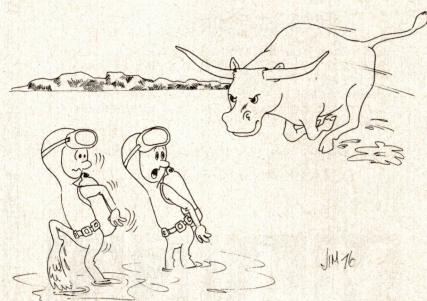
Underwater Symposium 77, Harvard Uni-
versity Science Center, Cambridge, MA
(Contact: Fred Calhoun, P.O. Box 291,
Back Bay Annex, Boston, MA 02117)

April 16

Underwater Film Review, John Hancock
Hall, Boston, MA, 8 p.m. (Contact: Fred
Calhoun, P.O. Box 291, Back Bay Annex,
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July 3

1977 CEDAM International Convention &
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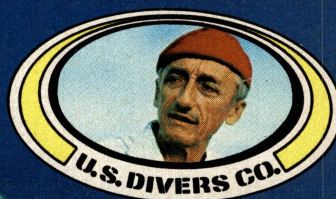
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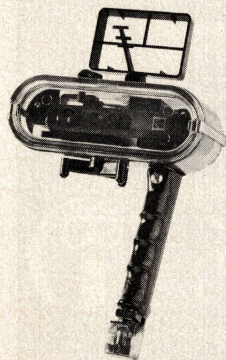
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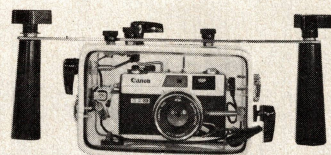
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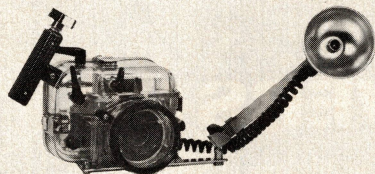
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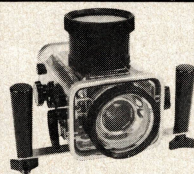
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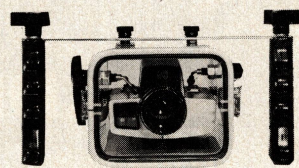
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Scuba I.Q.

Test Your Dive Knowledge

What's Your Diving Skills IQ?

In order to be safe when diving, knowledge is required to know what to do in various situations. Test your knowledge of dive skills by answering the following questions. Some questions have no reference, so the knowledge would have to be gained from experience or from an instructor. Answers are on the following page.

- 1) **The last thing to check before entering the water from a boat is:**
 - ☐ A. The current.
 - ☐ B. Your buddy.
 - ☐ C. Area below.
- 2) **If descending and pain is felt in your ears, you should:**
 - ☐ A. Ascend to the surface and try again.
 - ☐ B. Ascend several feet and clear ears.
 - ☐ C. Stop descent until pain subsides.
- 3) **The breathing pattern for a scuba diver should be:**
 - ☐ A. Faster and deeper than normal.
 - ☐ B. Slow with maximum exhalation.
 - ☐ C. Deep with normal exhalation.
- 4) **If during a scuba dive it becomes difficult to breathe from your regulator, you should suspect:**
 - ☐ A. The regulator is failing.
 - ☐ B. A clogged filter or valve.
 - ☐ C. You are low on air.
- 5) **While underwater, a buddy should rarely be farther away than:**
 - ☐ A. Touching distance.
 - ☐ B. Ten feet.
 - ☐ C. Limit of visibility.
- 6) **A submersible pressure gauge used by a diver will:**
 - ☐ A. Not be necessary if a reserve is used.
 - ☐ B. Keep the diver from running out of air.
 - ☐ C. Provide continuous air supply information.
- 7) **If a sharp, sudden pain in the ear is followed by extreme dizziness while underwater, you should:**
 - ☐ A. Breathe slowly and deeply until the pain and dizziness subside.
 - ☐ B. Surface immediately and signal for assistance.
 - ☐ C. Hold onto something until the dizziness subsides.
- 8) **A diver in the water should never casually wave to anyone because:**
 - ☐ A. This is a distress signal.
 - ☐ B. It wastes energy.
 - ☐ C. An arm is difficult to see.
- 9) **The easiest method of clearing a snorkel when returning to the surface is to:**
 - ☐ A. Tilt the head back exhaling the last couple of feet.
 - ☐ B. Exhale forcefully through the snorkel upon emerging.
 - ☐ C. Remove the snorkel from the mouth upon surfacing.
- 10) **In all normal scuba ascents, a diver should:**
 - ☐ A. Exhale all the way to the surface.
 - ☐ B. Breathe normally never breath-holding.
 - ☐ C. Maintain lowest possible lung volume.
- 11) **If ascending rapidly due to excess buoyancy, the surest method to slow the ascent is to:**
 - ☐ A. Vent air from your vest or buoyancy compensator.
 - ☐ B. Flare out to present the greatest resistance to movement.
 - ☐ C. Maneuver your fins above your head and kick downward.
- 12) **After compensating for buoyancy changes to achieve neutral buoyancy at depth, a scuba diver can expect changes in buoyancy due to:**
 - ☐ A. Respiration.
 - ☐ B. Air supply depletion.
 - ☐ C. Both of the above.
- 13) **A disadvantage of a rolling entry is that the diver is likely to:**
 - ☐ A. Flood the mask.
 - ☐ B. Lose the regulator.
 - ☐ C. Become disoriented.
- 14) **When your buddy hits a closed fist against the chest, which of the following is being indicated:**
 - ☐ A. Respiratory difficulty.
 - ☐ B. Out of air.
 - ☐ C. Low on air.
- 15) **If separated from your buddy while underwater on a dive, you should:**
 - ☐ A. Search in the direction where the buddy was last seen.
 - ☐ B. Ascend a few feet and search for bubbles.
 - ☐ C. Search for not more than a minute, then surface.

Scuba I.Q.

Test Your Dive Knowledge

What's Your Diving Skills I.Q.?

Answers from questions on preceding page.

- 1) C. Area below. It is wise to check the current, your equipment, your buddy's equipment, the dive plan and to notify the divemaster that you are entering the water, but the last thing to check is the area below. Divers have been seriously injured from other divers falling onto them. A fully equipped diver falling from a height presents a dangerous situation. Be sure the area below is clear when entering, and get and stay clear of all entry areas when in the water around boats.
- 2) B. Ascend several feet and clear ears. The end of the eustachian tube, which connects the throat to the middle ear, lies in soft flesh. As pressure builds up, the end of the tube is actually held closed, and equalizing becomes difficult or impossible. Ascending enough to relieve the pressure allows the end of the tube to be opened and pressure equalized. When descending, equalize early and often, trying to keep a pressure difference from building up.
- 3) C. Deep with a normal exhalation. Many divers do not think about their breathing, or concentrate on it too much. Neither is good. Proper breathing habits must be developed and the diver must be aware of the rate and volume of respiration. Breathing plays an important role in bottom time, buoyancy, heat loss, anxiety and elimination of carbon dioxide and nitrogen. A slow deep inhalation followed immediately by a slow exhalation to normal expiration level helps assure optimum gas exchange. Always keep breathing and be aware of how you are breathing.
- 4) C. You are low on air. Air is delivered from your regulator at ambient pressure. As the tank pressure approaches ambient, it becomes difficult to breathe at that depth. If you ascend, however, additional breaths will be available because the surrounding pressure will decrease from the ascent. It is never a good idea to breathe a tank to this point, though. The air supply should be closely monitored and the dive terminated when the tank pressure is 300-500 p.s.i.
- 5) A. Touching distance. The buddy system is the most violated safe diving rule in the sport. With no practical method of communication except tactile and visual signals, divers should have minimal separation. It is not easy to buddy dive correctly, so just entering the water with another diver will usually result in separation. You must develop buddy techniques, plan dives and check with your buddy frequently to remain together. Once you are able to remain together with a buddy underwater diving becomes much safer and more enjoyable.
- 6) C. Provide continuous air supply information. Even though a submersible pressure gauge is a passive device, it is one of the most valuable items of equipment a diver can have. A gauge allows dive planning based on the air used and can prevent the diver from running out of air. Submersible pressure gauges should always be used by all scuba divers and should be checked frequently during dives to monitor the air supply.
- 7) C. Hold onto something until the dizziness subsides. A sharp, sudden ear pain followed by dizziness indicates a ruptured ear drum. Cold water rushing into the middle ear can cause sudden and acute vertigo. Disorientation will be severe until the water inside the ear warms. It is best to hold onto something or even to hug yourself until the dizziness subsides. Prevention is by far the best measure, so stop or reverse a descent any time ear pain is experienced.
- 8) A. This is a distress signal. Many times divers wave to signal "hello" or "OK." The correct long range surface signal for "OK" is to touch the hands together overhead forming a large "O" or to touch the fingertips of one hand to the top of the head, also forming an "O." Waving is a distress signal, but the standard emergency signal is an upraised arm slapped down against the water repeatedly. Know the standard diving hand signals, use them and don't wave to others while in the water.
- 9) A. Tilt the head back exhaling the last couple of feet. This method of snorkel clearing requires considerably less effort than blasting a column of water out of a snorkel by forceful exhalation. Removing the snorkel from the mouth requires more effort since the head must be lifted out of the water. If you only know how to clear a snorkel by blowing the water out of the tube, have another diver teach you the preferred displacement method of snorkel clearing.
- 10) B. Breathe normally, never breath-holding. The key to safe ascents when breathing compressed air is maintaining neutral lung volume — neither high nor low. Exhaling all the way to the surface is not a good idea except for emergencies and having a very low lung volume might cause an embolism just as having maximum lung volume might. To ascend properly, simply keep breathing normally and do not hold your breath.
- 11) B. Flare out to present the greatest resistance to movement. In a runaway ascent situation, flaring is the surest method to slow down. Trying to vent air from a vest may result in not being able to locate the exhaust valve or in not being able to vent the air fast enough. By extending the arms and legs spread eagle and bending back to a horizontal position, sufficient drag is created to slow even highly buoyant ascents. Watch buoyancy closely to prevent runaway situations.
- 12) C. Both of the above. A diver can change buoyancy by several pounds with controlled respiration. Breathing shallowly with nearly full lungs will make one more buoyant and breathing shallowly with nearly empty lungs will make one less buoyant. This breath control can be used to advantage to maneuver or to gain leverage underwater. Buoyancy also increases during a scuba dive by about five pounds as the diver uses the air from the scuba cylinder.
- 13) C. Experience disorientation. During a rolling entry it is not uncommon for a diver to become disoriented for several seconds. This is not desirable and can be prevented by using other suitable entries. Also, rolling entries prohibit view of the entry area totally or partially and can cause equipment to shift or loosen. If a rolling entry is used, be prepared for these possible problems.
- 14) C. Low on air. It is important for all divers to know and use the standard hand signals approved by the American National Standards Institute which have been published in SDM. There must be no mistake for such signals as "low on air," "out of air," "give me air" or "danger." Review hand signals with your buddy frequently and always when diving with a new partner.
- 15) C. Search for not more than a minute, then surface. Separation will be less likely if buddies will agree on a heading and then maintain that direction until both agree on a new heading. This makes it easier to get back together after separation since a buddy would be either in front or in back of you. Ascending a few feet to look for bubbles may help if the water is murky near the bottom but both should surface if unsuccessful in a reunion within one minute.

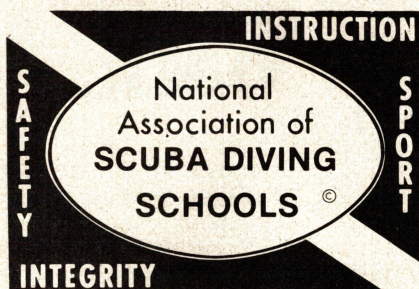
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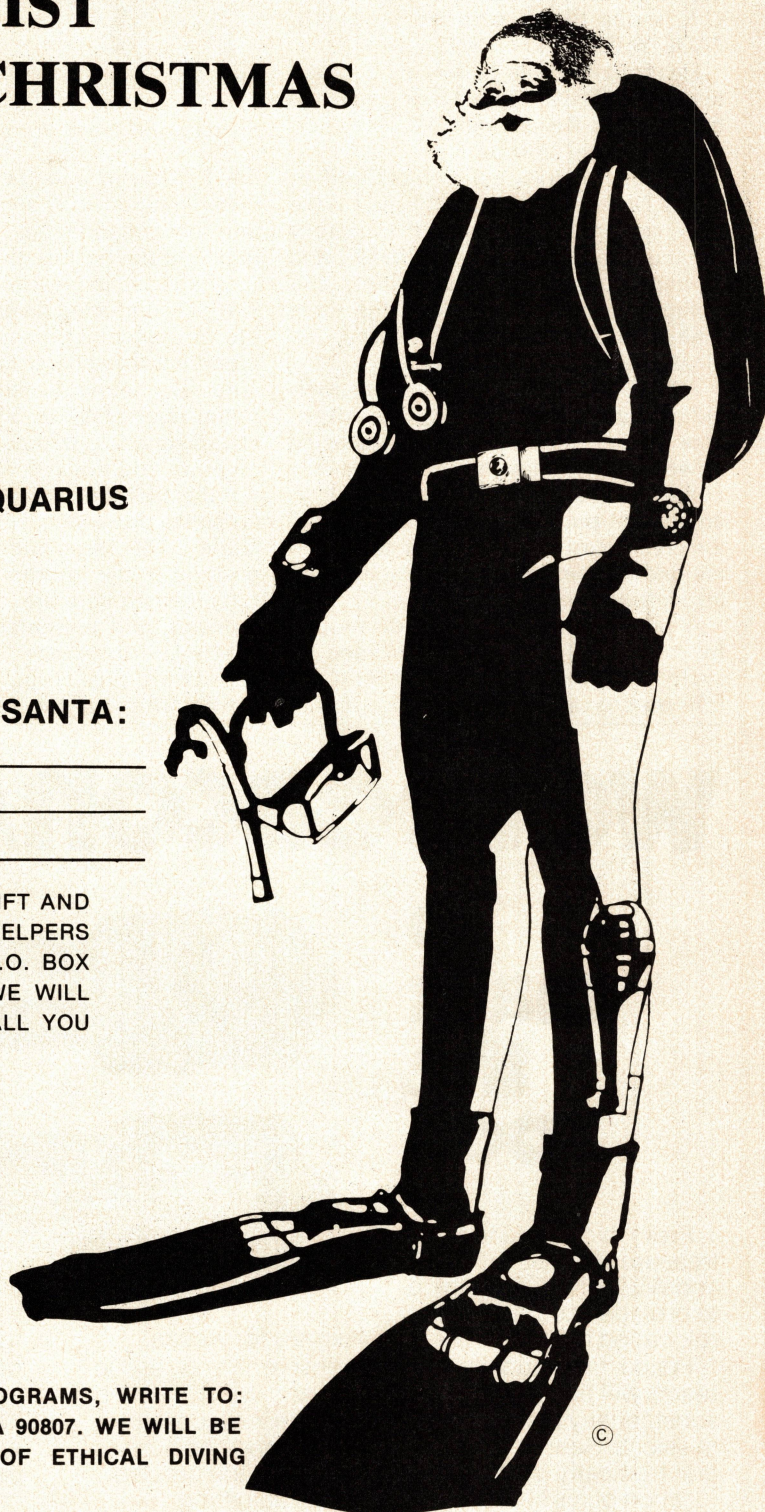
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Diver Association Expands

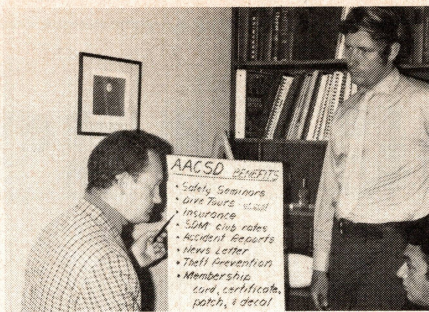
The American Association of Certified Scuba Divers, Inc., has expanded to full national operation. Tony Franklin, president and founder of the group, announced that 1976-1977 charter membership limit will be 100,000, or 10% of the total estimated one million active U.S. scuba divers certified by NAUI, PADI, YMCA, and NASDS.

Headquartered in Stamford, Connecticut, AACSD was formed over a year ago by Franklin, Ray Slyman, Wally Ackerman and Noel Voroba.

The American Association of Certified Scuba Divers, Inc. was established as the only nationally recognized nonprofit service organization of its kind dedicated to improving scuba diving safety and training procedures, while at the same time providing diver benefits and services unavailable elsewhere.

AACSD's founders believe that individual divers are not able to take advantage of the "mass muscle" purchasing power an association might provide on a nonprofit basis in many areas such as equipment purchase, group travel, customized tours, and discount tickets to major diving oriented events such as film festivals and seminars.

A program being actively developed by AACSD's Tour Division, headed by Wally Ackerman, involves low cost, no frills trips to various top dive locations in



AACSD founders are (left to right) Tony Franklin, Wally Ackerman, Ray Slyman and Noel Voroba (not shown).

the Caribbean and the Pacific for the diver who prefers economical travel and land accommodations, with more dive time and the best in dive facilities.

Of special interest to married divers, AACSD conducted an extensive study of life insurance companies and the high premiums they charge for diver coverage (any dive below 40 feet). At extra premium rates of \$7 to \$15 per \$1000 of coverage, a \$20,000 policy might cost a diver an additional \$300 per year. Unless the additional charge is paid, a regular policy does not cover a diving related fatality. The Association questioned the position of the insurance experts, carefully researched the diving mortality statistics, and presented its case to the Sentry Life Insurance Company of Stevens Point, Wisconsin.

After studying the facts, Sentry Life

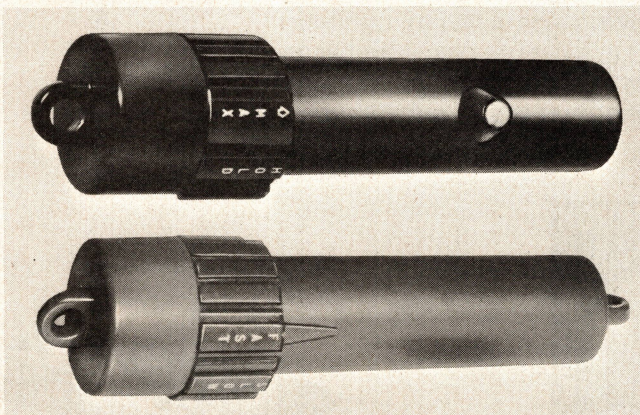
agreed to provide qualified AACSD members with an exclusive low cost package of group life insurance which offers up to \$50,000 coverage for death from all causes, including diving, irrespective of depth and circumstances (ice diving excluded). The remarkable part of the package is that Sentry Life's group life rates are actually lower than most conventional group plans.

AACSD will be conducting an active program of local level seminars and slide/film presentations open to both members and guests on a variety of subjects, with heavy emphasis on dive safety. Dramatic demonstrations will cover marine hazards, first aid, life saving, emergency procedures, and cardio-pulmonary resuscitation. Many of these subjects, together with announcements of Association sponsored photo contests and special events, will be covered in *Deep Thoughts*, AACSD's free member newsletter.

AACSD membership is open to all certified U.S. scuba divers. Further free information on AACSD services and additional membership benefits is available upon request. Send a postcard with name and address to: American Association of Certified Scuba Divers, Inc., Dept. P, P.O. Box 3820, Stamford, Conn. 06905. For charter membership, indicate your certifying organization, the month and year you were certified, and enclose \$9 for a one year enrollment (\$14 for two years, \$18 for three years).

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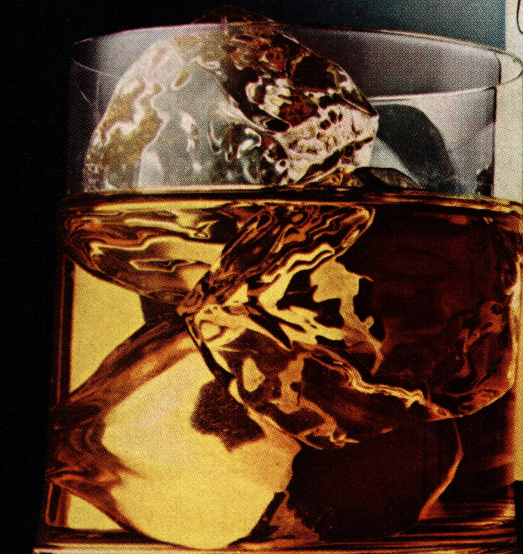


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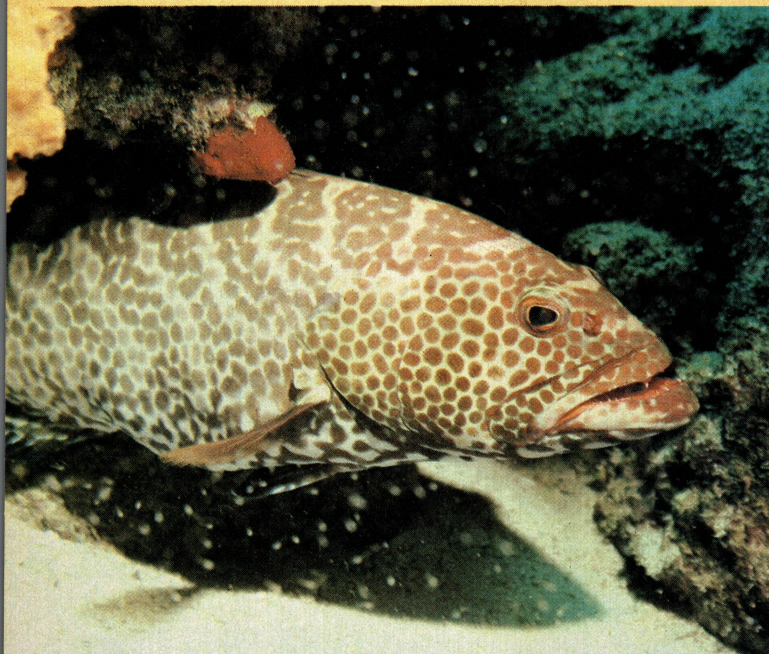
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The Nassau grouper is found in waters from Brazil to North Carolina.

Text and Photography by Carl Roessler

The tiger grouper of the Caribbean



Small grouper indigenous to Red Sea



Ocean Gallery

THE GROUPEL FAMILY



A red grouper from the Red Sea



The indigo hamlet from Bahamas

The hunting technique is unmistakable. The prey, often a small fish, swims quietly past that shadowy honeycomb of crevices that is the reef face. Suddenly there is an echoing thump! and a larger fish explodes out of the shadows and engulfs the prey. A member of the widely varied family of groupers has once again completed its characteristic ambush.

On one occasion I observed a small grouper (rock hind) attack and swallow a parrotfish that was two-thirds the grouper's own size. For some time after the ambush the grouper merely sat motionless, munching contentedly with the parrotfish's tail protruding from its mouth.

This family of fish is extraordinarily varied in size and coloration, with adult members ranging from a few inches to 12 feet and over one thousand pounds. Thus, as you can imagine, the prey can range from tiny shrimp to those legendary cases where divers have been reported attacked by giant groupers. Having once seen in Bonaire a grouper perhaps seven or eight feet long I am a fervent believer in the possibility of trouble from these enormous predators.

The groupers and allied species are members of the family Serranidae, the sea basses. Serranid in general possess rather large mouths, and an interesting way of using them.

When you hold a piece of fresh bait in your hand to entice a grouper to approach, particularly a larger specimen, the fish will invariably begin by gliding in close to hover near your hand, watching carefully. Then it will without warning abruptly open its mouth wide, creating a suction which causes the bait to leap from the hand into the grouper's mouth.

Known to be one of the finest tasting fish in the sea, groupers possess three characteristics which have rendered them particularly vulnerable to extermination by spearfishing, in a classic case of nature's processes working on all of nature's creatures — except man.

First, groupers are curious, intelligent animals, and on a virgin reef will hover above their lairs watching the approach of even armed spearmen without concern.

Second, their defensive techniques are solely adapted to escape from fast swimming predators such as sharks. Thus, when pursued, a grouper will simply go to ground, staring out at the diver from the presumed safety of a coral crevice or cave which would protect him from the shark. This is of course no defense at all against the speargun.

Finally, and most tragic for the species, there is substantial evidence in many grouper species that individuals change sex at some point in their lives. For this reason the rationalization that many spearmen use that "We only shoot the big ones" leads to the extermination of all breeding males.

The Serranid include a number of small, brightly colored and unusual species. Among these are the exquisite *Liopropoma* (candy basslet) and the brilliantly varied hamlets (*Hypoplectrus*). Indeed, the hunting groupers display almost as spectacular coloration as the butterflyfish and angelfish.

A number of grouper species have the ability to change color, exhibiting different patterns when alarmed or when sleeping. The coney, for example, is chocolate brown with black rimmed blue spots all over its body. When this species is alarmed you can watch it flush its lower half to white and contract its spots to mere pinpoints, the entire process taking no more than a few seconds. The coney also occurs in blood red and canary yellow, the latter a truly spectacular fish. While the groupers are fearsome hunters in their own reef society context, the relentless pressure of spearing has all but wiped out many species on the reefs of most inhabited islands.

Jewfish (the giant bass), Nassau groupers, tiger groupers, black groupers and others are only echoes of the past on these reefs. The only hope for restocking are the very young females who will eventually mature to become breeding males, or the possibility of pelagic juveniles being transported by ocean currents from other still populated reefs.

Perhaps all divers will eventually agree that it's time for the hunt to end, and the recovery of this fish family to begin.



Medifacts

Disorientation Below

By Charles V. Brown, M.D.

Last month we described the role of the middle ear's vestibular apparatus in detecting orientation and motion. Small ear stones called otoliths rub against the hair-like vestibular nerve endings and tip off the brain as to which way is down, and also about straight line acceleration. Currents induced in the semicircular canals detect rotational acceleration. In spite of all this, loss of orientation below

is a very real and ever present threat to divers. Our vestibular apparatus is always on duty, but topside we've grown accustomed to relying more on other clues to keep a level head. Foremost of these is vision, and it's no use at all in dark or murky water, or when there's nothing around to look at for reference. Experiments show, for example, that when a man tries to stand perfectly still, his

body sway more than doubles if he shuts his eyes. That's at sea level. It more than triples if he's in a chamber at 300 feet equivalent pressure.

Our bodies are also equipped with little gadgets called proprioceptors. These are special internal sensors that detect stress and motion in muscles and joints. Since gravity causes postural stresses,

(Continued on Page 28)

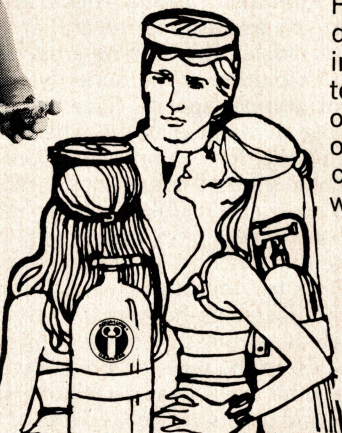
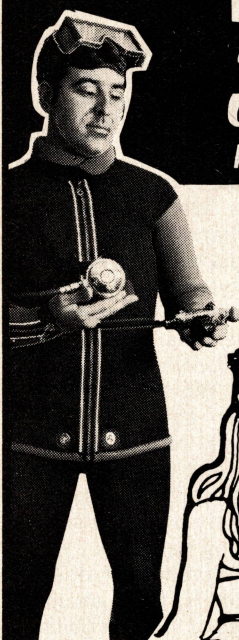
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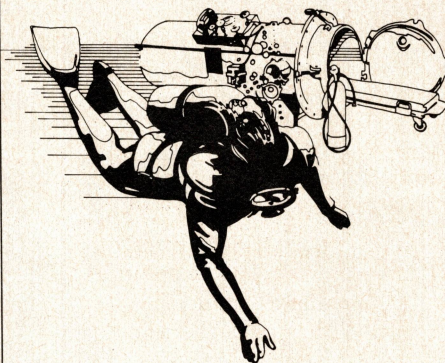
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Medifacts

(Continued from Page 26)



proprioceptors are able to tell the brain which way gravity is pulling or, in other words, which way is down. They, too, are of little use in the water, where gravity is largely negated. Finally, pressure sensitive nerves in the skin help orient us to gravity through the seat of our pants, the soles of our feet, etc. — another lost cause underwater.

Deprived of all these customary orienting clues, the diver becomes vulnerable to even small disorienting influences that would ordinarily be no problem, and yet underwater he's apt to encounter bigger ones than he would on land. He rocks and rolls with wave and surge. Pressure and temperature stresses assault his ears.

Sometimes it's enough to make his head spin.

An analysis of 2500 USN dive accidents revealed that between 10 and 20% of the victims had vestibular symptoms. Besides loss of orientation, these include nausea, lightheaded or giddy feelings, and vertigo. Vertigo is by far the most assertive and incapacitating. Luckily it's usually brief, and the main danger is that the victim will panic and do something foolish. Another is that he may vomit.

Any landlubber can get vertigo, given the right precipitating factor. Common ones are ear infection or allergy, circulatory disorders, migraine, low blood sugar, hysteria, drug effects, and carnival rides. Divers have their own special precipitating factors: bubbles, barotrauma, boosted gas tensions, and others.

Any of these can trigger vertigo more easily if one vestibular apparatus is damaged, say by some previous disease or injury, and therefore responds abnormally. A given stimulus acting on both sides equally would induce different responses in the two vestibular nerves. This confuses the computer in the brain,

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which concludes that its owner must be spinning. On land the brain is not fooled, for the incorrect message is thoroughly quashed by a lot of other, correct sensory input. But underwater, the sensory deprivation we have described leaves the bad message uncontested, so it's instant vertigo. Such people just can't dive.

Folks with normal vestibular apparatus can get vertigo, too, if unequal stimuli reach the two sides. One way this occasionally happens is by infection in just one of the middle ears. Divers achieve unequal stimulation in two interesting ways, one involving pressure and the other temperature. A few years ago, in a survey of some 2000 Swedish divers, more than 20% confessed to vertigo while submerged. This would occur usually during vertical motion, especially ascent. More recent surveys in other countries have confirmed the findings, though reported incidence varies widely. The explanation is that one eustachian tube is working better than the other, so one middle ear winds up with more pressure pushing on its oval and round windows against the inner ear fluid. This either stimulates the one vestibular nerve or alters its sensitivity. The resulting dizziness lasts for several seconds to several minutes, and may sometimes be stopped by slowing one's ascent. Since this vertigo is due to change in pressure, the term "alternobaric" was coined to describe it.

Australian hyperbaric experts reported a way to get vertigo based on temperature differentials. It seems appropriate to term this sort "alternothermic." The diver has a partial obstruction in one external canal — maybe wax, or one of those bony overgrowths we mentioned last month. Cold water fills both canals and chills the eardrums, which chills the air in the middle ears. Now it happens that the horizontal semicircular canal passes very near the wall between the inner and middle ear, and when a diver assumes the horizontal posture, it gets tilted to a roughly vertical position. The cold air in the middle ear chills the fluid within the horizontal semicircular canal, which becomes denser and sinks, setting up a current in the canal. This tries to convince the brain that the head is turning. So far there's no problem, for the right and left canals develop equal but opposite currents, and their messages cancel each other out. As the diver swims along, his body heat warms the water in the external canals, while turbulence keeps exchanging it with more cold water. But the exchange will be much slower on the blocked side, so it becomes warmer than the other side. The induced currents in the semicircular canals become unequal, and vertigo strikes again.

Suppose you find yourself dizzy and disoriented underwater. You won't panic — you've too cool a head for that.

Let's say you'll become strongly concerned. The normal reaction at such times is unconscious breath holding while you try to figure out what's going on. That could be disastrous, for you could be ascending without realizing it. The correct action is to relax and breathe normally. Overbreathing lowers your CO₂ and underbreathing raises it; either will just make you dizzy. Try to get your buddy's attention. Look at or hold on to some stable object; you'll know you're not moving, and it will give you a reference. Divers have been known to swim horizontally or even downward, in the belief that they were going upward, so when you're ready to ascend, turn on the common sense. Dropping your weight belt or inflating your BC will send you up, but you'll sacrifice control, and that's dangerous, too. First try to utilize other clues. Remember that bubbles go up and lead goes down. A weight belt held by one end will always tell you which way is down. If you relax totally, your feet will drop while your more buoyant chest tends upward. Your regulator will breathe harder if you are facing upward, and mask squeeze indicates that however you are facing, you are still dropping. Such subtle clues would never penetrate a barrier of panic, so keeping your cool is really essential.

Once out of the water, don't get back in till you see a doctor and make sure that whatever was wrong gets fixed.

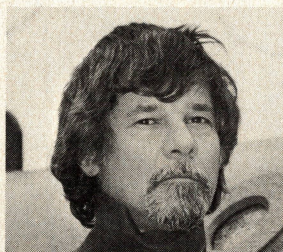
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Scuba Instructor Certification

December 5-10

NASDS Clinic, Florida (Contact: NASDS, P.O. Box 7666, Long Beach, CA 90807)

December 13-19

PADI Instructor Training Course, Jacksonville, FL (Contact: Fla. PADI College, 4593 St. Johns Ave., Jacksonville, FL)

December 20-26

PADI Instructor Training Course, Jacksonville, FL (Contact: Fla. PADI College, 4593 St. Johns Ave., Jacksonville, FL)

January 3-March 11

PADI Instructor Training Course, Jacksonville, FL (Contact: Fla. PADI College, 4593 St. Johns Ave., Jacksonville, FL)

January 9-March 27

26th Los Angeles County Underwater Instructors Certification Course, pre testing Dec. 4-5 (Contact: L.A. County Dept. Parks & Recreation, Underwater Unit, 155 W. Washington Blvd., Los Angeles, CA 90015 (213) 749-6941 ext. 636)

January 9-15, 1977

NAUI Instructor Training Course, Honolulu, HI (Contact: Roy Damron, 954 Kului Pl., Honolulu, HI 96821)

February 26-27, March 5-6, 12-13, 19-20

YMCA Scuba Instructor Institute, Metro New York area. (Contact: Roy Kieser, 25 Benson Ave., Sayville, NY 11782)

March 4-6, 18-20

YMCA Instructor Certification Institute, Olympia, WA (Contact: Bill Allen, Rt. 8, Box 344-B, Olympia, WA 98502)

March 12-13, 19-20, 26-27, April 2-3

YMCA Scuba Instructor Institute, New England Area. (Contact: Tony Salerno, 105 Beech St., Fitchburg, MA 01420)

March 19-20, 26-27, April 2-3, 9-10

YMCA Scuba Instructor Institute, Western New York area. (Contact: Ed Sexton, 1880 Salt Rd., Fairport, NY 14450)

March 25-27, April 15-17, May 13-15

YMCA Scuba Instructor Institute, Southwestern Oklahoma State University, Weatherford, OK (Contact: Ken Rose, Health, Physical Ed, Recreation Dept., SW Okla. State Univ., Weatherford, OK 73096)

April 15-17, 28-30-May 12-14

YMCA Scuba Instructor Institute, Boca Raton, FL (Contact: Doug Curtis, P.O. Box 642, Boca Raton, FL 33432)

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April 30-June 26 (6 weekends)

NAUI Instructor Training Course, Rockport, MA (Contact: John S. LeClair, 78 Circuit Rd., Medford, MA 02155)

May 21-27

YMCA Instructor Institute, Key West, FL (Contact: Tom Mount, P.O. Box 1547, Key West, FL 33040)

June 25-26

NAUI Instructor Crossover, Rockport, MA (Contact: John S. LeClair, 78 Circuit Rd., Medford, MA 02155)

Texas U/W Film Festival

The Inland Divers Association (IDA), a Fort Worth, Texas, dive club, will hold their fourth Underwater Film Festival in the Tarrant County Convention Center, Fort Worth, Texas, at 7:30 p.m. on Saturday, January 15, 1977.

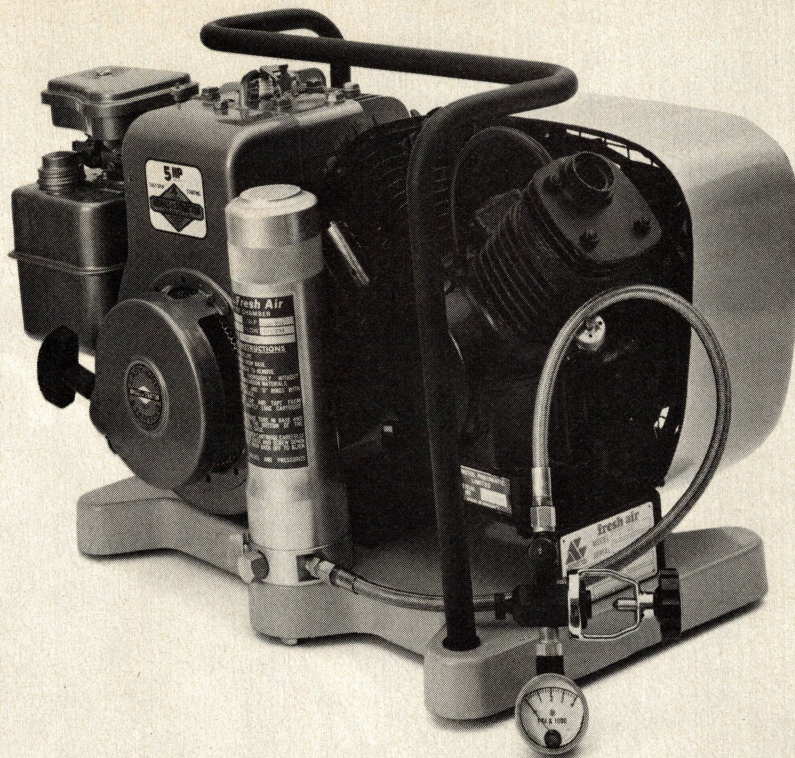
One of the main purposes of the film festival is the IDA's underwater photography contest. Entries last year came from as far away as Canada, Guam, Mexico, and the Virgin Islands, as well as other states. Contest categories will include prints, slides, and movies. Contest rules, entry blanks, and other information can be obtained from Dennis Corcoran, 6313 Greenfield Rd, Fort Worth, TX 76135, Ph. (817) 237-9710. The entry deadline is January 2, 1977.



The feature event of the evening's entertainment will be a personal presentation and narration by Harry Pederson of his color film *Four Fathom World*. Pederson has devoted a lifetime to delving into the secret, mysterious, curious, and fascinating four fathom world.

Before and after the evening's entertainment, there will be manufacturers' and dealers' displays of dive and underwater photographic equipment in the lobby of the main auditorium together with winning photo contest pictures, dive vacation tours, etc.

Tickets to the film festival sold at the door will be \$3. However, advance tickets are \$2.50 each and can be obtained by contacting Dennis Corcoran. 



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The Octopus Alternative

By Jim Hall

The beginning of this article was taken from official accident reports and an interview with a surviving diver. It is a story of mistakes, mistakes that are repeated too many sad times each year. Mistakes that could happen to you. At the request of the survivor and to protect the deceased, some facts have been omitted, but the story and its lesson remain intact.

Like most days on which dive accidents occur, this one began with no hint of trouble. Two good friends departed for a day of diving aboard a commercial charter boat. Both were certified and had been diving regularly together in the past. The area was familiar to them and they had a purpose for going there — a fine seafood dinner for their girlfriends.

The boat arrived at the dive site by mid-morning. The bottom was a steep slope interspersed with boulders and angled deep down beyond the limits of safe sport diving. Knowing this, the skipper anchored in a cove 40 feet deep. Conditions were prime — the air and sea were calm, the water warm and clear. Both divers hastily geared up and were among the first to plunge over the side of the boat. Neither checked the other's gear. Not checking each other's equipment had become a habit with them because they dived together in a very tight buddy team. They had to, one diver relied on a J valve and his buddy's pressure gauge to monitor his air supply.

Settling slowly to the bottom through wine bottle green water into a school of small blue fish, the divers relaxed and unhurriedly worked their way down the slope into deeper water, looking for shellfish. Searching for the shellfish, cleverly camouflaged and hard to distinguish from the rubble that lined the slope, occupied most of their attention and each checked the other only to make sure they were maintaining close buddy contact. At about 80 feet Diver A motioned that his regulator was breathing hard and they mutually agreed to go no deeper and to direct their hunt back up toward the cove and into shallower water.

Not long after this, Diver A noticed that despite the shallower depth, his regulator still breathed hard. He reached back to activate his reserve lever and recalls being startled to find that it was already down. Diver B was nearly 40 feet away and looking into a crevice. Diver A, worried because his regulator was breathing very hard and knowing his tank was nearly empty, swam fast to Diver B and signaled that he was out of air.

Diver B's first reaction was to give up his air supply. He fumbled for a few seconds because he had unknowingly strapped his regulator to his shoulder beneath his tank harness before leaving the boat. Sharing air, difficult under most circumstances, was now amplified by the shortened hose. However, these were experienced divers in a comfortable environment and they quickly settled into a good rhythm of buddy breathing and began to swim to the surface.

At a depth between 30 and 40 feet, Diver B glanced at his pressure gauge and unstrapped his tank, handing it to Diver A. With one final deep breath, his last, he swam up into the bubbles attempting a free swimming emergency ascent.

Diver A twice comes close to tears recalling the accident. He deeply regrets causing his buddy's death.

"Everything happened so fast that all I was thinking about at the time was reaching (my buddy) and getting some air. My head was pounding when I reached him . . . we couldn't buddy breathe too well while trying to make it to the surface because his regulator was caught under his tank strap. I remember being worried about embolism and thinking it was taking forever to reach the surface. Then he just handed me his tank, took a deep breath and pushed away. If he had had an octopus rig he'd still be alive."

In 1974, the year for which we have the latest scuba accident statistics, situations like this were enacted at least 11 times in the United States. In many, many other instances either the buddy of the victim did not, or more importantly,

could not, offer proper help. Dr. John McAniff, the man who compiles the Underwater Fatality Statistics Report for the University of Rhode Island is probably the most familiar with the dynamics of what happens during an underwater accident. He recently remarked, "The buddy breathing system unqualitatively does not work."

Dr. McAniff firmly believes that any circumstance in which the mouthpiece is removed creates a potentially hazardous situation. Buddy breathing, he points out, is an extremely complex motor skill that requires a considerable amount of overlearning before it becomes automatic. Additional studies by Dr. Glen Egstrom at UCLA indicate that the skill, once acquired, deteriorates rapidly unless practiced regularly.

This lack of practice is probably the number one reason why buddy breathing attempts fail during emergencies. Combine lack of practice and the difference in training methods and emphasis of the various certifications agencies, non-adherence to the buddy system, the difficulty in maintaining buoyancy and operating a manual buoyancy device while buddy breathing and the perceptual narrowing that occurs in panicked divers gives you just about the perfect combination needed to blow an emergency situation. The first time you see the cold body of a former dive buddy lying on the deck of a boat or the beach will make you realize that something is seriously wrong in the way we have approached emergency out-of-air situations.

Why? The answer is shockingly simply: Resistance to change among our instructors. Buddy breathing and free ascents are still being taught as the only alternatives to out-of-air situations. But when asked, most instructors will admit that the octopus rig would make some emergencies much easier to handle. A few even have one themselves. Yet most students still get certified without even the most fundamental familiarization of the octopus rig.

The most vocal instructor opponents to the use of the octopus rig are the proponents of the equipment rip-off philosophy. They see the octopus as just another way to fatten someone's pocket or another gimmick foisted on America's innocent diving population.

Let's put these myths to rest once and for all. Cost is a poor argument. The 65 dollars or so that you spend to modify your regulator (we'll explain the dangers in back yard modifications) is expensive, but a life is priceless. Thinking that you'll never run out of air or that when you do, you will be able to make an easy free ascent or that your dive buddy will be competent at buddy breathing is dangerous. Not spending the money because you see it as an investment in someone else's safety is not only selfish, it is incredibly shortsighted. The purchase of an octopus rig is as much for your own safety as it is for whomever you are diving with. Buddy breathing struggles underwater often result in double deaths and not infrequently result in the death of the rescuer. Remember that the skill you acquired sitting on the bottom of your dive school's pool may have to be put to work in murky, rough and deep water with a near berserk companion.

The solution to the octopus rig controversy must lie with the instructional agencies. They have been slow to take leadership in this matter and develop formal training standards for use of the octopus rig in their curriculums. There exists no uniform standards of procedure or location of the device. Some agencies, notably PADI and NASDS, are moving in the right direction. In a recent issue of the Undersea Journal, PADI changed its standards for Open Water training as follows: "At depths greater than 30 feet, special equipment for a loss of air situation is strongly recommended. This equipment includes an octopus arrangement on each regulator . . ."

With this in mind, we joined Dennis Graver, National Training Director of PADI, on a day of diving off Redondo Beach,

California, as he worked out the problems of standardizing the octopus rig for a training program he will be offering in the near future. Depths ranged from 30 to 60 feet, depending on which particular facet of the experiment needed testing. Before the dive, Nancy Ackerman, Dennis and I listed the things we wanted to test and most importantly, the myths about the octopus regulator we wanted to dispel. Our dive plan for testing the octopus rig looked like this:

- 1) Configuration—a. right-handed access, b. left-handed access, c. length of hose.
- 2) Positions — a. dangling, b. strapped to the side of the tank, c. neck strap, d. attached to center of chest.
- 3) Approaches — a. front, b. either side, c. rear.
- 4) Ascents — a. with weight belt, b. without weight belt, c. holding onto buddy, d. buddies not touching during ascent.
- 5) Mechanical Performance — a. breathing simultaneously, b. alternate breathing, c. breathing resistance at depth (full and near empty tanks), d. rate of consumption, e. breathing with second stage upside down.

Our tests were very enlightening and we strongly recommend that our results be considered by every training agency and the National Scuba Training Committee. We are not advocating the abandonment of buddy breathing — that is a very useful skill and should continue to be taught — however we feel our evaluation of the octopus rig now enables us to have a superior alternative to many out of air situations. Further testing, and any ideas this article stimulates, may reveal even better techniques.

There appears to be minimal value in which side the octopus rig is located. Several companies manufacture regulators that have an octopus located on the left-hand side of the diver. All others have a right-handed access. What is very important is the length of the octopus hose. For proper positioning of the receiving diver and to prevent too great a kink in the hose, the octopus rig should be at least 10 inches to a foot longer than the primary air supply. Poseidon leads the field with a four foot long hose and most others meet our required minimum. Side exhaust regulators such as Poseidon and AGA Divator present the least problems as they can be held in the mouth without twisting.

Positioning of the octopus when not in use appears to be the most critical consideration. It must be ready and accessible for immediate application. Most divers we have seen just let it dangle. This is unacceptable for two reasons. First, it creates a potential snagging problem. Secondly, by allowing the emergency second stage to drag, it will fill with sand. I learned the hard way during one of our simulated emergencies what it is like to grab and breathe from an octopus rig that is filled with sand. A less experienced diver in a real emergency would most likely choke on the first breath.

Attaching the second stage to the side of the tank was only slightly better than letting it dangle. Certainly, sand did not seem to accumulate, but an equally dangerous and far more subtle situation was created. Twice while swimming into deeper water using this configuration, Dennis approached me from behind and to one side, placed the octopus rig in his mouth and began to breathe. Upon feeling the tug of my octopus being taken (this was a blind test and not in our dive plan, done to see my natural reaction), I instinctively turned around to see what was happening. The result was that the regulator was pulled from Dennis' mouth by the force of my rotation. It doesn't take much to imagine what could happen to a panicked diver who happened to be inhaling at the time.

Carrying your short hosed primary second stage around your neck with a strap and breathing off your octopus is a potential hazard. Proponents of this configuration argue that it is best to let the panicked diver grab your mouthpiece, or if there is time, offer it to him. Remember Dr. McAniff's words, . . . "any time the mouthpiece is removed creates a potential

hazard." There is likely going to be very little time during an emergency to calmly hand over your air supply and switch to the regulator strapped to your neck. Indeed, the panicked diver may, as happened in our tests, take your face mask with your air supply. Twice during pool tests with novice divers, the regulator came out, but the mouthpiece remained firmly clenched between the instructor's teeth. At worst, you run the risk of losing your air just when you might be inhaling.

Our tests showed us that what is needed does not exist. The best possible location for the octopus when not in use is attached to the chest area of the diver by a firm snap. The hose should be under the diver's arm for positive control. Lanyards are too long and do not hold well. Velcro gets clogged with sand and does not have the gripping power to hold a heavy second stage in place. The buoyancy compensator pocket makes quick access difficult and hides the distinctive bright color of most octopus second stages.

What is needed is a snap or firm friction clamp that will hold tightly and come free with a determined tug — either by the out of air diver or by the donor in case his regulator has been seized. The shoulder straps of most tank harnesses or the flaps of the buoyancy compensator pockets are areas that lend themselves readily for modification to this configuration.

Attaching the octopus to the diver's chest has other advantages. It forces the needy diver to get the attention of the donor and prevents any instinctive reactions that might further endanger his life. The chest area can be reached from virtually any position of approach and last, but not least, attaching the alternate second stage to the chest area keeps it readily available to the donor. By teaching new students the chest position, we can reduce the danger of having regulators ripped out of the donor's mouth in an emergency situation.

We made many, many ascents during our testing. First, we tried the traditional method of dropping the victim's weight belt before ascending. If done by both parties, perhaps because of extreme depth, this is marginally acceptable. Dropping the victim's weight belt without dropping your own is *absolutely not recommended*. It became a real wrestling match between Dennis and myself with Dennis acting as the anchor during our ascents. The problems we had maintaining good control would only be magnified by novice divers. The rescuer should be ready to drop the victim's belt on the surface if complete control has not been achieved during the ascent.

We agreed that two positions seemed good during ascents. Side by side, with arms linked is acceptable. You do sacrifice some control of the victim this way, but eliminate some mouthpiece strain from the bending of the hose. Face to face ascents are probably the best and ascents without touching are easily accomplished if both divers are relaxed. However, no one can be sure when someone is likely to panic — the situation described at the beginning of this article showed panic happening about half way through the ascent. So, we concurred the face to face mode with the donating diver holding firmly onto the victim's tank straps is probably the most prudent ascent position.

Prior to our water tests we wanted to dispel some myths about the performance of octopus regulators. Opponents to this system often say that it is impossible to get a good airflow on a near empty tank (they presume that both divers will have used almost the same amount of air during the dive). To test this hypothesis, we asked Leon Cerniway and Grady Fort of U.S. Divers to conduct some tests for us. Regulators were randomly pulled from production and flow rate and resistance tests were made. The regulators were balanced piston designs and the tests were done on tank pressures of 300 psi.

In every test, the octopus second stage delivered at least 80% of its designed airflow. The primary regulator continued to deliver the factory rated flow (around 15 cfm) even when breathed simultaneously with the octopus rig. There was a

OCTOPUS UNITS AVAILABLE

Manufacturer	Model	Length of Hose	Working Pressure	Fastener	Price	Additional Information
AGA Corporation	yellow	42"	90-125 psi	none	\$121.00	polycarbonate and stainless second stage
	gray valve	42"	90-125 psi	none	\$146.00	has exhaust on side
AMF Swimaster	MR12II	36"	130 psi	none	\$ 64.00	left-handed second stage has chrome plated brass case
Airmatic	Octopus system	29"	130 psi	none	N/A	right-handed second stage has chrome body
Dacor Corporation	Olympic 2STL	39"	140 psi	none	\$ 65.00	right-handed second stage has yellow hose protector for identification
Healthways	Scubair II Octopus	34"	130 psi	none	\$ 65.95	right-handed second stage has a chrome plated brass case
Poseidon Systems, U.S.A.	3204 Octopus 300	46"	156 psi	none	\$ 95.00	exhaust system on side of the second stage
Scubapro	#129 Custom Octopus 2nd Stage	30"	120-140 psi	clip	\$ 80.00	left-handed octopus has chrome plated brass case
Sherwood Selpac	Sherwood SRB-3007	36"	130 psi	none	available on request	
Sportsways	911-0 Octopus	35"	100-130 psi	none	\$ 64.00	the octopus is a right-handed second stage
	931-0	35"	100-130 psi	none	\$ 64.00	
U.S. Cavalero	223.001 C-Octopus	40"	120 psi	clip	\$ 56.00	right-handed octopus has Delran case
U.S. Divers Co.	1099-00 Octopus	39"	125 psi	none	\$ 54.95	left-handed second stage has chrome plated brass case
U.S. Nemrod	#6265 Sirius	32"	95 psi	none	\$ 56.00	right-handed second stage has lightweight Luran case
	#6269 Delta II	32"	135 psi	none	\$ 65.00	right-handed second stage has chrome plated case
White Stag	Sea Lung Deep II	35"	130-140 psi	none	\$ 50.00	right-handed second stage has chrome plated brass case

slight, but significant increase in the force necessary to open the second stage valve (called "breaking effort" by engineers). This effort increased by about one-third over what the regulator was designed for and did so on both second stages. This effort is not enough to present a problem in an emergency situation if the regulator used is in good shape. The main factor affecting the flow rate through the second stage is the internal configuration of the first stage. Therefore, some regulators will breathe easier than others with an octopus rig. Most top of the line regulators have been designed with this in mind, but you may encounter some problems modifying economy models.

Our field test subjectively confirmed our laboratory findings. Even with an almost empty tank in 60 feet of water there was little discernable difference in performance. The breaking effort was noticeable, but no more so than diving with a regulator that needed a tune-up. What did concern us was the rapidity at which the air is consumed while using an octopus rig. Little time should be wasted in beginning the ascent during an emergency. If you are low on air and your buddy needs help, get to the surface immediately. Alternate breathing could conserve the air supply but it is only a temporary solution.

We also learned to watch out for the exhaust tees on most regulators. In normal breathing positions, there will be no problem. However, should your buddy wind up with the regulator upside down in his mouth he could breathe (a little wet, we admit) if the exhaust tee fits under his mask. The large size of the exhaust tees on the regulators we tested caused my mask to flood twice. An already panicked diver doesn't need his mask flooded just as he gets some air. Worse, a suddenly flooded mask could snap a marginally controlled diver over into panic. Poseidon and AGA Divator eliminate this hazard with their side exhausts and most other exhaust tees can be trimmed down with a sharp knife to fit under a mask.

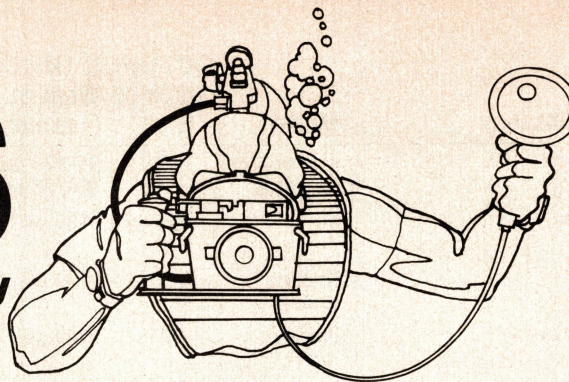
Care should be taken if you are considering altering your present regulator to take an octopus rig. Early single hose models were designed with tilt valve mechanisms to deliver air on demand. This was a simple arrangement of a spring, and a valve seat held closed by the pressure coming from the first stage. They had relatively low intermediate pressures to keep breathing resistance to a minimum. Today, all regulators use a downstream valve that is held closed by a spring pushing the valve seat against the pressure coming from the first stage. This prevents overpressurization of the regulator hose — tilt valve hoses would sometimes explode if the first stage leaked. With the introduction of the downstream valve it was possible to increase the intermediate pressure and get superior flow rates to the second stage. Since the intermediate pressure has been raised considerably in most regulators available today, adding a tilt-valve second stage will only create a regulator whose demand valve is held closed by the increased pressure.

Different brands of regulators have different intermediate pressures. For this reason, use only a second stage that is of the same brand to modify your regulator. Most good dive stores have some excellent rebuilt second stages to soften the impact on your pocketbook. Factory new octopus second stages run from \$50 to \$146, depending on the manufacturer.

There is no doubt from our tests that the octopus rig would immediately begin saving lives if it were adopted everywhere. The reality of the situation is that because of backward attitudes and consequent consumer resistance it is not used by more than 10% of the divers today. Buddy breathing and free ascents should still be taught until the day comes when the octopus rig becomes a viable alternative. We have done the tests, we have made the recommendations. It will be interesting to see what the instructional agencies do in the future to promote this aspect of diving safety.

abc's

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CHAPTER 12

CAMERA HANDLING REVIEW

By Jim and Cathy Church

The purpose of this final article of the ABC's series is to review and summarize basic camera handling techniques. Specifically, we will suggest methods of handling your camera system — the camera, strobe and exposure meter — before, during and after a photo dive.

Before the Dive

Prepare your camera system well ahead of time. Concentrate solely on getting your equipment ready — don't attempt to make delicate adjustments when you are rushed. We suggest the following procedure:

1. Inspect and clean your equipment. With a Nikonos camera, clean and lubricate the O rings as illustrated in Chapter 5. With housed equipment, inspect all controls, O rings and latches, and clean and lubricate whenever necessary.
2. If you are using a strobe, make sure that the battery has been recharged or replaced if necessary, and that the capacitor has been formed as directed in the owner's manual.
3. Attach the strobe connector cord to the camera and test flash the strobe before you load the camera with film. This helps save film if you have any problems triggering the strobe with the camera shutter release.
4. If your system is complicated — arms, brackets, meter mounts and other accessories — completely assemble the system before you pack it for the dive. Even if you must partially disassemble the system to pack it, the test assembly ensures that you have all the parts and special tools you need.
5. Pack the camera system in a box lined with foam rubber or other suitable padding. Don't just pack your camera in the gear bag with your diving gear.

Entering the Water

Your camera system can be damaged when you first enter the water. Just how you should handle your equipment depends on whether you are diving from a boat or from shore. Let's begin with entering the water from a boat:

1. Keep your camera system in its camera box until the last moment — most adjustments should be made ahead of time!
2. If the boat has a high freeboard, don't jump in holding your camera system with your hands. The shock of hitting the water can damage delicate internal parts and upset adjustments such as the fit of a PC cord to a housed camera or strobe.
3. If someone is available to hand you your camera after you are in the water, show them exactly how to pick up and hold your camera system. Otherwise, the camera or strobe could detach and either one could fall to the deck.
4. When you are aboard some dive boats — especially the multi-hulled boats with a flat deck — there is a basic technique

of easing your camera system into the water without help. Simply lie face down along the edge of the deck and lower your camera system into the water with one hand. When the camera is submerged, hold your mask in place with your other hand and roll off the edge of the deck into the water.

5. If you lower your camera over the side of the boat with a line, choose a place, such as where the side of the boat curves inward at the bow, where the camera will not bump into the side of the boat. For best results, lower the camera so it is a couple of feet below any surface wave action, and be sure that it is not in the way of other divers when they enter or leave the water. Don't use a line in rough water as the up and down tugging on the line could damage your camera system.

6. With boats having low freeboard, such as inflatables, you can often reach into the boat to take or replace the camera when you are in the water. A plastic laundry basket with a life preserver or other padding in the bottom is an excellent place to store the camera.

Diving from shore presents different problems. How you handle your camera system depends on how far you will be swimming and how rough the surf will be:

1. For long swims, use a surf mat or other suitable flotation device with lines or lanyards to secure your camera gear. Some photographers use an inner tube with a partial cover over the sides and bottom.
2. If the surf is rough, think twice before taking a complicated camera system into the water. With just a Nikonos, you can hold the camera with the lens assembly pressed against your body or wet suit. However, remember that it may be more difficult getting your camera out of the water than getting it in on rough days.

During the Dive

Underwater camera handling is important for dive safety as well as good photographic technique:

1. The first step to good U/W camera handling is to be a good diver. A good U/W photographer is relaxed and comfortable in the water and doesn't need both hands for the mechanics of diving.
2. Your entire camera system should be attached together so it forms a single unit which can be carried with one hand. You should be able to drop the entire camera system at a moment's notice in an emergency situation.
3. We recommend that you do not use a neck strap underwater. From a safety standpoint, it may be difficult to remove the strap from around your neck in an emergency. From an equipment standpoint, we've seen several cameras and other



items of photo gear damaged because the equipment was dangling below the photographer and collided with hard corals, rocks or the rungs of a boarding ladder.

4. As soon as you enter the water (and are clear of other divers who are entering or leaving the water), check your equipment for leaks. This applies mostly to equipment housed in transparent plastic housings because you can easily see the source of any leakage.

5. As soon as you reach bottom, stop and recheck all camera adjustments and the switch settings on exposure meters and strobes. With the Nikonos III, check the shutter speed dial frequently because you may sometimes rotate the dial to another speed when operating the camera with gloved fingers.

6. If you are using a handle and thumb release with a Nikonos, use the thumb release carefully. Beginners often have a tendency to push too hard on the release. This puts excessive strain on the shutter speed control shaft and can rip the film loose from the cassette when you reach the end of the roll. With the Nikonos III, excessive pressure on the film advance lever at the end of the roll can rip the sprocket holes in the film which can make rewinding difficult.

7. Use accessory control knobs — such as the rubber knobs which come with a Nikonos lens — very carefully. The increases in width and length these knobs provide also gives your fingers increased leverage when you operate the knobs. We've seen three Nikonos lenses damaged because the photographers turned the control knobs past the calibrated settings — two were turned past f2.5, and one past infinity. All of these lenses were fitted with the rubber accessory knobs.

8. If you are using slip-on lens accessories, or threaded filters or close-up lenses, the space between the accessory and the Nikonos lens assembly must be flooded. When removing a lens accessory — especially those which unscrew — hold the control knobs of the Nikonos lens to prevent the lens from turning and breaking the O ring seal between the lens and camera body. We know of two photographers who actually removed Nikonos lens assemblies from the camera bodies while attempting to unscrew filters while underwater!

9. When swimming from one subject area to another, hold your camera system so that you can see it. Otherwise, you can

easily lose slip-on lens accessories or optical viewfinders that are not attached to the camera with safety lines.

10. If you have a complicated camera system, and will need help getting it out of the water, make sure that you have planned this event ahead of time!

Reloading in a Boat

A small, open boat is the worst place you can find to open your camera for a film change, especially if the boat is crowded with other divers. Should you decide to change film aboard a boat, follow these precautions:

1. Wait until the other divers are in the water — the risk of saltwater spray reaching your camera is too great if they are jumping in or climbing back aboard.

2. Rinse the camera and your hands thoroughly. A blast of low-pressure air from a dive tank can be used to blow water off your unopened camera.

3. Warning: Dry your face and hair — a drop of seawater can easily fall from your head as you look downward at your opened camera.

4. If there is any chance of spray being blown onto the camera, have another photographer hold a towel as a windbreak to shield your camera.

Because it only takes one drop of seawater to start corrosion inside a camera body, we avoid reloading our cameras aboard small, crowded boats.

After the Dive

Tend to your camera equipment as soon as the dive is over:

1. During boat trips, get your camera equipment safely packed in a padded camera case as soon as you get it out of the water. Don't worry about getting saltwater on the foam rubber — it can be washed with fresh water later.

2. If you don't have a camera case, place your equipment in a safe place where it can't roll over as the boat rocks, and where it won't be stepped on or sat upon. If exposed to direct sunlight, cover your camera equipment with a white towel to prevent heat buildup which can damage cameras, film and some electronic components.

3. As soon as possible, wash your camera equipment under a running tap to remove all traces of salt. Unopened cameras and strobes can be soaked for several minutes in fresh water. To help flush out tight places, loosen meter mounts, Nikonos trays and other such fittings, but leave the Nikonos connector screwed into the Nikonos flash socket to keep water from the electrical contacts.

4. Open your Nikonos as soon as it has been washed and dried to remove film and inspect the inside for leakage.

5. Follow the manufacturers' instructions for after dive care of strobes, exposure meters and other accessories.

6. Wash and dry your camera case and padding. Apply WD 40 to hinges and other hardware to combat corrosion. ➤

Assignment

1. Visit your local dive shop and ask what systems of arms, bars and brackets are available for combining your camera, strobe and exposure meter into a single unit that can be carried with one hand while you are in the water.

2. Also, ask what padded camera cases are available, such as those distributed by Oceanic Products and Subsea Products.

3. Make a written checklist you can use when you prepare your camera equipment for a photo dive.

Photo Quiz

1. Can jumping into the water with a camera system cause internal damage and sometimes even flooding?

2. Is it better to have your exposure meter bracketed to your camera or camera housing than to have it floating above you on a cord or dangling below on a chain?

3. Should you try taking underwater pictures before you are a certified, experienced diver?

NOTE: Neither Jim or Cathy, or SDM, can critique your work. Answers to the above: (1) yes, (2) yes, (3) no.

O'NEILL'S SECOND GENERATION SUPERSUIT SYSTEMS

AN SDM PRODUCT REVIEW

By Ed Cargile



Are you interested in staying warm on your next dive and enjoying the experience to the fullest? Well, keep the faith! Within recent years there have been some tremendous advances in the whole area of thermal protection for divers. An important contribution made in this area has been the development of the O'Neill SuperSuit System.

The SuperSuit and the subsequent development of the whole accessory system is the pride of the O'Neill suit line — and justifiably so. For six years now the SuperSuit has been updated and modified to assure that it is as precise as possible.

Insulation against cold water and for body heat retention is accomplished in several ways:

The SuperSuit, as are all O'Neill dive suits, is designed around two V shaped seams that meet at the center of the body. The converging V design provides a snug and comfortable fit, reduces stress on seams and allows maximum body movement. Nylon two is used for the bottom V shaped panels to provide a tough, abrasion resistant surface over the upper inner legs, knees and fanny. Smooth neoprene, nylon one or nylon two, is used for the rest of the suit, depending on the colors desired and how much abrasive diving you are going to do. The inside of the SuperSuit has nylon throughout for easier donning and doffing.

All the seams are triple glued and taped. A new nylon stretchable tape, called Seal Tape, has been developed by O'Neill. This tape is applied with heat to all seams inside the suit, except in the crotch area. Because of the stress in this area, 1/8 inch nylon one is glued over the crotch seam inside the suit for reinforcement.

A special, patented design is incorporated into the SuperSuit, called the O'Neck. The 1/8 inch neck is nylon one inside and smooth skin outside. About two inches of it is tucked back inside like a reversed turtleneck sweater. Any air placed inside the suit tends to slightly inflate the O'Neck, sealing the tucked in edge comfortably and snugly. The Seal Hood is worn over the O'Neck, holds it in position, and makes an effective seal.

Special cuffs are bonded to the arms and are made of 1/4 inch nylon one with the smooth side out. This provides an excellent seal against the smooth inside the nylon gloves. If nylon one gloves are not worn, the cuff can be tucked back in with the smooth skin against the wrist.

The SuperSuit is available with or without attached boot (SunSocks). Without boots, the ankle cuffs are like the arm cuffs, nylon one in, smooth side out. The smooth inside of the nylon one boots is slipped over for a watertight seal.

Located on the upper front left shoulder is an oral inflator on a flexible hose. No air is introduced into the suit until reaching approximately 20 feet. A couple breaths of air should be blown through the inflator to relieve the suit squeeze from the outside water pressure. The inflator mouthpiece has a bypass purge valve to ensure no water can be blown into this advanced system. By blowing into the mouthpiece and purging out the water, then pressing the inflation button, only air is allowed to enter the SuperSuit. Although the SuperSuit can be inflated, SKIN DIVER maintains that no sport diver should ever

enter the water without a personal flotation device or BC.

An adapter is available to connect the suit inflator to the low pressure port of the regulator's first stage. This lets you add air to the suit from your tank without removing the second stage from your mouth.

As far as SuperSuit accessories are concerned — besides the convenience zipper which is now available for men — several options may be chosen.

ACCESSORIES — O'Neill has a wide variety of accessories for their dive suits. These accessories make up the total systems approach which has been taken with the O'Neill thermal protection system.

SEAL HOOD — The new Seal Hood is a blend of 1/8 inch and 1/4 inch neoprene to give a good seal around the face and neck, ease of entry and maximum insulation in critical heat loss areas. Five pieces make up hood (nylon two \$18.95).

OTTER PAW — Originally developed for the U.S. Navy, the Otter Paw is a three fingered, nylon one mitt with long sleeves that comes in 3/16 or 1/4 inch thicknesses. The Otter Paw has nylon on the outside to withstand abrasions. Seal Tape is used on all the seams and a strip of 1/8 inch nylon one is glued between the thumb and forefinger for added strength.

The design cut of the Otter Paw is in the natural relaxed palm position, instead of being flat. Standard hand sizes are available (nylon one \$19.95).

SUNSOCK — These soft soled boots come in 3/16 inch or 1/4 inch nylon two neoprene. The SunSock comes attached or separate. Standard shoe sizes are offered (\$24.95 attached).

SOLE SLIPPER — Made of rugged 1/8 inch nylon one knobby rubber, the Sole Slipper is designed to go over the SunSock for walking on rough terrain ashore. The Sole Slipper has a built-in arch support and a zipper for easy entry (\$19.95).

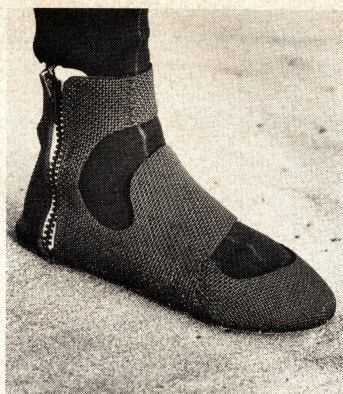
COLD CONTROL SUIT — The Cold Control Suit provides insulation across the chest and fills up the air space in the back. It is made of 1/8 inch neoprene and has short legs and arms. The Cold Control Suit is double breasted, providing 1/4 inch of thickness across the chest. It opens down the left side to below the waist and has three velcro straps for adjustment.

The Cold Control Suit can also be used as a tropical water suit to prevent tank strap burns and reduce sunburn problems. The suit comes in nylon one (\$59.95).

BENTHOS INNERSUIT — In very cold water the Benthos InnerSuit can be worn under the SuperSuit. This new concept in thermal protection utilizes a three layer material. The inside layer is a strong, porous athletic cloth which allows the material to breathe. The middle layer is made of a continuous synthetic fibrous filler, a very efficient lightweight insulator, even when wet. The outside is a waterproof navy blue nylon.

The Benthos InnerSuit has attached boots. It compresses down very easily and allows slipping into the SuperSuit smoothly. The price is \$120 and is available in stock sizes.

MILITARY AND COMMERCIAL DIVING — O'Neill is continuing its research program to provide better equipment. The U.S. Navy approached O'Neill in 1975 and asked them to develop a diving suit system for the new Navy MK XII Diving



System, utilizing the SuperSuit with its Helmet Adapter Ring.

The Navy Experimental Diving Unit in Panama City, Florida, has made approximately 600 dives with the O'Neill SuperSuit System, with only two leaks (one was a tear by a diver and the other a defective zipper). When the Navy MK XII Diving System is approved, it will be the standard diving system throughout the U.S. Navy.

The O'Neill SuperSuit and accessories such as the Helmet Adapter, the OverSuit and Walking Overboots are being used more and more in commercial diving around the world.

The SuperSuit comes in either 3/16 inch or 1/4 inch neoprene rubber. There are over 50 color combinations available for various suit panels. The colors include black, red, blue, orange and even tie dyed blue. Underwater photographers really like the brighter colors.

Over the years O'Neill has developed 18 standard sizes for both the SuperSuit, from small through extra large, both short and tall. These sizes will fit more divers, a savings of about \$20 for custom cutting. The base price of the nylon one SuperSuit is \$340; the base price of the nylon two SuperSuit is \$370.

Maintenance of the SuperSuit is not time consuming or complicated, but very important. The suit should be soaked in fresh water after every day's diving. The SuperSuit zipper should be lubricated with a light silicone spray or a light application of bee's wax stick. This is available from both O'Neill and Aqua-Craft.

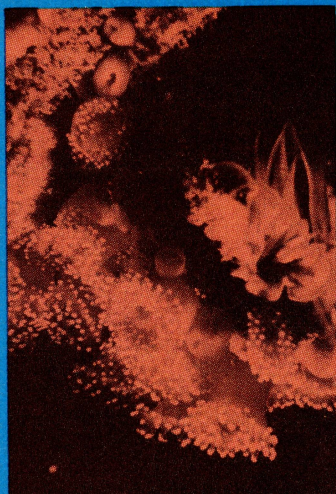
The suit should be air dried. For storage, the suit should be hung on a wide plastic or wooden hanger. On the SuperSuit, the zipper should be left open, as long, continuous stress on the zipper teeth may cause them to become misaligned.

Should your suit need repairs, O'Neill dealers have been specially trained and have a full, in store repair station. If you are traveling to a remote dive location, a Sport Kit is available to enable you to maintain and repair your own suit.

QUALITY CONTROL — An extensive quality control program is incorporated into the O'Neill suit manufacturing operation. Every SuperSuit made has an individual serial number marked on the inside of the top. Before every SuperSuit leaves the O'Neill facility all of the openings are sealed and the suit is pressurized with air. A soapy spray is used to find any possible leaks. A repair schematic is kept on file by serial number to maintain a complete history on every suit. Appropriate manufacturing changes are made when indicated by these quality control measures.

CONCLUSION — It's true this equipment costs more money than the local discount house dive suits. But as we started this review, I asked you if you would be interested in staying warmer on your next dive. That is still a very good question, because becoming cold and miserable on a dive can destroy all the memories of your underwater experience. Possibly you should visit your local dive store to see this equipment and consider what the SuperSuit System would do for you as a major piece of your dive gear. Or you can write for more information to O'Neill: 1071 Forty-First Avenue, Santa Cruz, Ca. 95060. >#





Take a SECOND DEEPER



Look at BREAKWATERS

By Mark E. Gibson

One of the most important features that makes a great dive is diversity — lots of different organisms inhabiting a variable, often spectacular, undersea terrain. However, many dive sites, regardless of their geographical location, become monotonous to frequent visitors because of a lack of diversity. Thus divers are always on the move to find new diving environments that offer increased diversity and appeal. Unrealized by many divers, this move can be a very simple one. Just visit a nearby breakwater.

Breakwaters were designed with the protection of a harbor in mind. Yet they provide an extra service for divers because breakwaters become colonized very rapidly, thus becoming an artificial reef. Frequently built on sandy bottoms, they create a new habitat — the rocky environment. Hence, around breakwaters two very different habitats exist. The sandy bottom supports one particular group of organisms while the rocky breakwater supports another. The beauty of this situation is that both environments can be explored on one dive because of their exceedingly close proximity.

The Coast Guard breakwater at Monterey is an excellent example of this phenomenon. Constructed out of rock rubble and boulders up to four feet in diameter, the breakwater environment, and its organisms, provide an intriguing contrast to the organisms living on the sandy bottom. While it may appear that there is little interaction between these two habitats, such is not the case. There is an artificially created, yet beautiful, dynamic relationship here, and at breakwaters around the world. With the use of some basic marine biology, a few visits to a breakwater will make these relationships evident.

As a general rule, rocky surfaces support more life than sandy bottoms. Thus the entire volume of life in the area is increased over what it was previous to the addition of the breakwater. As one moves away from the breakwater, the amount of life gradually becomes more representative of the surrounding natural sandy bottom, and the amount of life present gradually decreases. But those forms of life found on

the distant sand can be very different from those found nearer the breakwater. For instance, the delicate tube anemone (*Pachycerianthus fimbriatus*) forms a strip about 30 feet wide running parallel to the breakwater for most of the latter's length. Once the diver is more than 30 feet from the breakwater, these anemones become quite rare. The same applies to the soft coral sea pen (*Stylatula elongata*). Both these organisms are feeding on microscopic life in the water.

Question: Where would there be more food for these animals, far away from the breakwater, or next to it? Keeping in mind that rocks support more life than the sand, the answer would be next to the breakwater. This probably is because the many forms of life on the rocks reproduce with drifting larvae that serve as food for the tube anemone and sea pen. It should be evident that the addition of the breakwater, and its subsequent colonization, has affected the density of certain sand dwellers. This increase in density works to the diver's advantage in terms of encountering more diversity on a dive. Without the breakwater there no doubt would be many fewer tube anemones and sea pens in the area.

These two examples demonstrate one effect the breakwater has on the sandy bottom. What about the life on the rocks? These usually are forms that exist on rocks in the nearby surroundings. But because the rocks were placed artificially, and may not be the same material as the natural surrounding rocks, the composition of the life on the rocks may be different. The Monterey breakwater supports massive colonies of the strawberry anemone (*Corynactis californica*), numerous sponges and red algae, and, because of all the caves and crevices, many reclusive organisms. This last point is most important because the porosity of the breakwater usually is much greater than that of the surrounding natural rocks. Sea cucumbers (*Cucumaria spp.*) and playful shrimp hide out in almost every crevice, as do crabs and a wide variety of fish.

While the great majority of organisms found on the rocks will be found only on rocks, there are others that move freely

photography by Author



photography by Author



The delicate tube anemone likes to make its habitat fairly close to the breakwater on the sandy bottom where the water is less turbid and there is more plankton to feed on. The sea stars roam over the rocks and can be found foraging the sandy bottom.

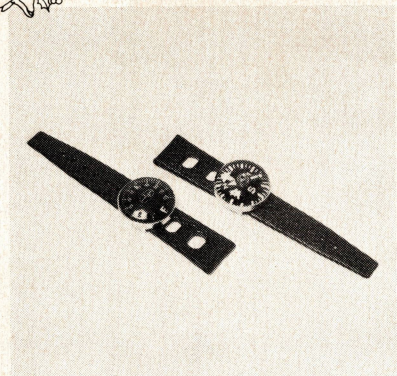
between the breakwater and the sandy bottom. The diver will encounter great numbers of sea stars scattered over the rocks, yet these same species can be found foraging over the nearby sandy bottom. As one moves away from the breakwater, the numbers of these sea stars decreases until, at about 75 feet away, only a few solitary individuals are seen.

Most interesting of those organisms that move freely between these two environments are the octopus. Hiding out in deep crevices during the day, these nocturnal animals rove over the rocks and sandy bottom at night. No night dive would be complete without the encounter of a ten inch diameter octopus with a diver. Sitting perfectly still in a depression in the sand, the octopus moves only when it is convinced its extravagant camouflage has failed. If the diver works cautiously enough, he can study the octopus for quite a while, as long as the diver bluffs the octopus into thinking it has not been seen. This sometimes crawling, sometimes swimming critter comes out from hiding in the rocks after dark in search of food. Had there been no breakwater here, there wouldn't be any octopus. And because of the porosity of the rocks here, many more octopuses are seen here than in the rocky areas.

The greatest numbers of organisms to be encountered on the sandy bottom are uncountable juvenile flatfish about one to three inches long, and the spindly arms of buried brittle stars. The flatfish, like the octopus, are well camouflaged and wait until the last moment before any escape measure is used. A sudden flap of the tail sends them undulating across the bottom for only a few feet. Then they freeze, hoping you will have lost sight of them. The five brittle star arms, however, stick up out of the sand a few inches and wave gently as they collect microscopic life from the water. The central body of the brittle star is buried in the sand, and so often they occur in great densities that it is difficult to pick out which arms belong to the same individual. Neither the flatfish or the brittle stars will be found behaving, or even existing, this way on the rocks.

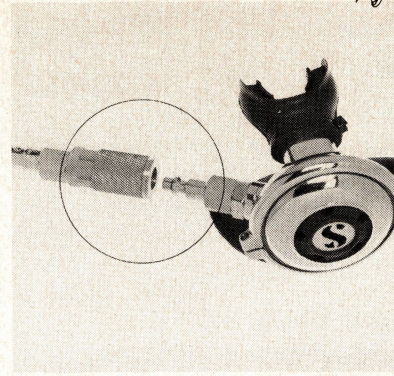
The breakwater also supports a large kelp bed along most of its length. As a result, the kelp canopy is a habitat for many fish and kelp dwelling invertebrates. Where there are little fish, there are bigger fish, and ad infinitum. So the area around a breakwater becomes the supporting foundation for a population of larger game fish. Ling cod and many species of rock fish inhabit the Monterey breakwater. Unfortunately, spearfishermen discovered this a long time ago, so that now an almost juvenile ling cod is considered a prize catch. Still, the area abounds with an incredible variety of fish that inhabit the kelp, rocks, or sandy bottom.

Regardless of whether the diver is in fresh water or an ocean, breakwaters offer much in terms of increasing diversity on a dive. While freshwater is less luxuriant in its forms of life, the addition of a breakwater still makes two dive environments, and the corresponding biota, available for appreciation. One suggestion if you plan to visit a breakwater: dive the sandy bottom first for two reasons. Primarily, the organisms on the sandy bottom usually are more mobile than those on the rocks. Your presence on the rocks first may scare the sand dwellers away. Secondly, sandy bottoms stir up much easier than the rocks. Try to cover the sandy bottom first very slowly so you don't stir it up too much (crawl on your hands and knees, forget about kicking), then move onto the rocks for the last part of your dive. If you visit the rocks first, chances are you will stir up the sandy bottom before you even get there. As you dive, keep in mind the changes you are witnessing as you move from one habitat to another. Notice their similarities and differences. Start asking some questions about the animals and plants you see and why they are present in one area but absent, or different, in another area. Then visit the area at night, asking the same questions. Your understanding of the aquatic world will greatly increase the pleasure you derive from diving. The next time you schedule a dive, keep in mind that breakwaters offer at least two dive environments. >>>

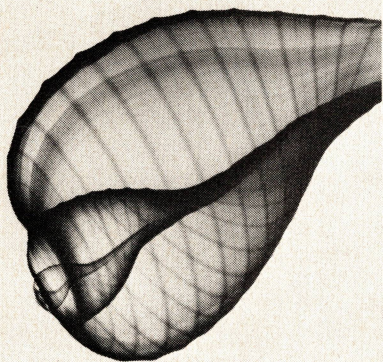


This compass and thermometer will each fit on your watchband. Both are sonic welded oil filled instruments. The thermometer reads from 0-120°F and is priced at \$7.95. The compass has an easy to read phosphorescent needle and principle headings. It sells for \$7.95. They are both available from Dacor Corp., 161 Northfield Rd., Northfield, Ill. 60093.

SDM'S CHRISTMAS GUIDE FOR DIVERS



The BUDDY CONNECTOR is a large, full air flow fitting that fits between the second stage and air hose. With it, your regulator can be attached to your buddy's extra LP hose without removing the regulator from your mouth. Priced at \$17.50 per set; Octopus set (two female one male) \$24.50. Sound-Wave Systems, 3001 Red Hill, Costa Mesa, Ca. 92626.



This unique underwater poster will add an elegant touch to any diver's home. The 16" by 20" art poster is an actual x-ray photo of a *Fiscus Ventricosa*. A poster of a *Lymnaea* is also available. Frame them both for an interesting gift to the shell collector. They are priced at \$1.95 each and obtained from Aqua-Craft, Inc., 3280 Kurtz St., San Diego, Ca. 92110.



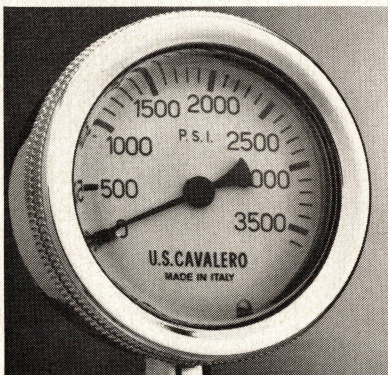
This Swiss made dive watch features a chrome case with a stainless steel back. Featuring an elapsed time bezel, it also has a 17 jewel automatic movement with an instant change calendar date. It has been tested to 150 feet and comes with a full one year guarantee. It sells for \$57 and is available from Aquadive, 3600 Wilshire Blvd., Los Angeles, Calif. 90010.



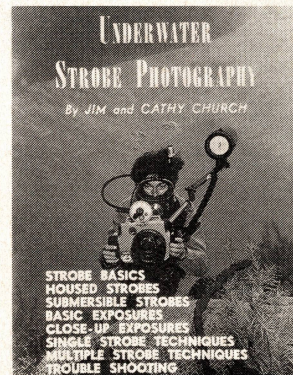
Aqua-Lung® knit watch cap is available in yellow or blue 100% Creslan acrylic knit and sells for \$4.70. Aqua-Lung's® foul weather jacket is made of heavy oxford nylon fabric with quilted polyester lining and is priced at \$33.25. The Aqua-Lung® windbreaker is made of heavy water repellent oxford nylon and is priced at \$20.25. At your U.S. Divers dealer.



Travelers Adaptable Bags are light-weight, rugged and durable gear carriers. They are made of colorful paracord fabric with 2" nylon web and have heavy Talon zippers. A mesh vent allows gear to dry. The four sizes fit gear from wet suit to regulator and are priced from \$9.50 to \$20. Available from TABs, 2111 S. Grand Avenue, Santa Ana, California 92705.

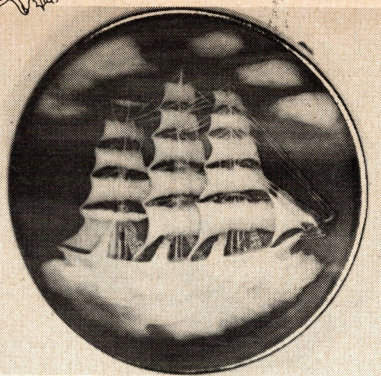


The C.S.S. Submersible Pressure Gauge features a large, fully luminescent dial, a rugged, triple chrome plated brass case and a 360 degree gauge swivel for easy reading. It is capable of indicating pressure to 3500 pounds psi. Selling for \$47.50, it is also available with a metric dial face. From: U.S. Cavalero, Inc., 3186 Airway Ave., Costa Mesa, Calif. 92626.

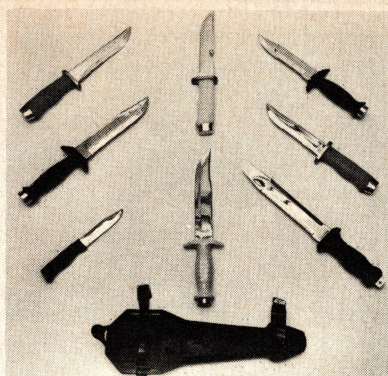


Underwater Strobe Photography is the name of a book devoted entirely to the equipment and techniques of using electronic flash underwater. Beginners as well as advanced photographers will find this book both interesting and informative. The 64-page text retails for \$4.95. It is published by Jim and Cathy Church, P.O. Box 80, Gilroy, California 95020.

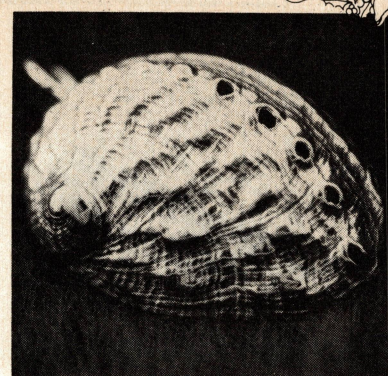




This Clipper Ship Belt Buckle is a beautifully detailed three dimensional carving made out of stone. It comes in navy blue with white clipper ship, waves, and clouds. The setting and back are made of chromed metal. A great gift idea for divers. It sells for \$9.95 and may be ordered from: Ronald L. Sperling, 11437 Edridge, Lake View Terrace, Calif. 91342.



These dive knives all feature blades that are made of a tough, rust proof steel alloy and are mirror polished. The handles are shock resistant and molded for comfort. Sheaths are molded by a special injection process and are made to hold knives firmly, yet release quickly. They are priced from \$12 to \$24.75. Wenoka Cutlery, P.O. Box 765, Framingham, Mass. 01701.



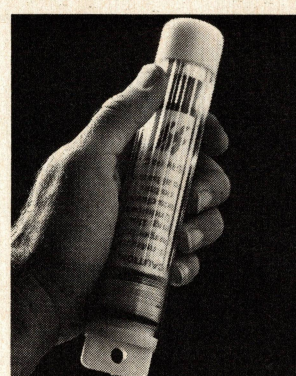
Exemplifying California shell life, this tiny reproduction of an abalone is less than an inch long and comes in sterling silver or 14 kt gold. The silver pendant, which comes with an 18" chain, is priced at \$25. The tiny abalone pendant in gold, which has a 15" chain, \$100. Both are available from Nathaniel, 3399A Mt. Diablo Boulevard, Lafayette, California 94549.



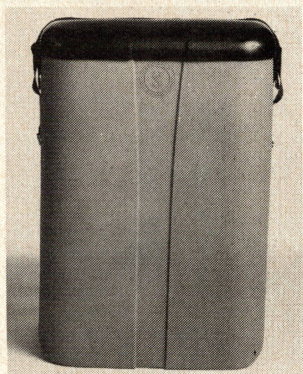
This lightweight, low volume mask offers wrap around vision and an easily adjustable strap that allows for a good fit. Paired with the Tube-Tab snorkel with a swivel for custom adjustment, this team adds up to comfort. The Mask I sells for \$27.95 and the Tube-Tab snorkel sells for \$5.50. Available from Tekna, 3549 Haven Ave., Unit E, Menlo Park, California 94025.



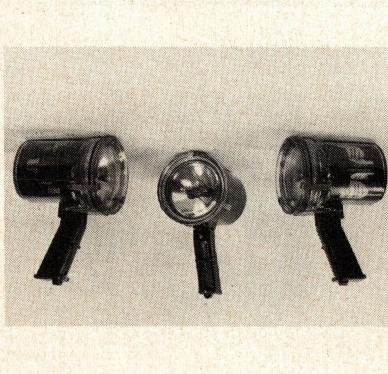
Featuring the colorful logo of a well-known diving equipment manufacturer, this indoor/outdoor thermometer can be a conversation starter. It is ideal for use on the patio, in bar or boat, or wherever divers congregate. Useful as well as decorative, it is 12" in diameter. It sells for less than \$40. Available from Scubapro, 3105 East Harcourt, Compton, Calif. 90221.



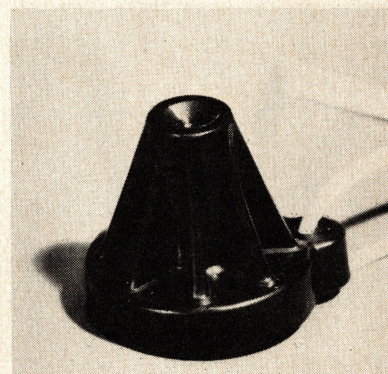
Super Q Lite features a long life halogen bulb, transparent Lexan® case, rechargeable nicad battery pack good for 90 minutes, complete housing and switch protected behind a massive O ring. It is pressure tested to 2000 feet. \$39.95 includes AC charger. Accessory holders and auto charger available. Underwater Kinetics, P.O. Box 2125, La Jolla, Calif.



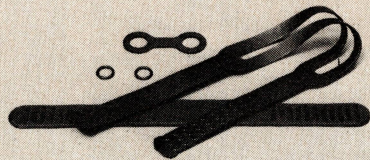
The Diver's Carry-all is a great idea for transporting and stowing all your dive equipment. It holds more than the conventional gear bag. Rigid, impact resistant construction protects your equipment. The shoulder harness assembly allows you to comfortably "back pack" your gear. It is priced at \$40. From Scubapro, 3105 E. Harcourt St., Compton, Calif.



These underwater lights feature an unbreakable design, foolproof sealing and a rotating on/off switch with a lock. They utilize six inexpensive "D" size flashlight batteries. The lights are available in clear, modular plastic or in black. Prices range from \$29.95 to \$32.95. Available from Ike-lite Underwater Systems, 3303 North Illinois St., Indianapolis, Indiana 46208.



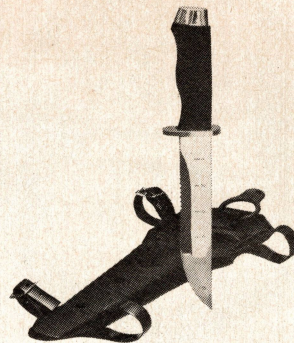
Keep dirt, grime and water out of your delicate first stage with a regulator protector. This particular model features an O ring seal and is molded of high impact resistant plastic. It self centers on the thumb screw. Priced at 95¢, this regulator protector keeps the orifice free from dirt, sand. Available from Aqua-Craft, Inc., 3280 Kurtz, San Diego, California 92110.



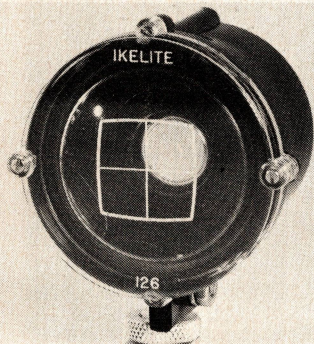
Designed to prevent those frustrating times when a minor, but an integral part of your equipment breaks or gets lost, thus ruining your dive plans, the Save-A-Dive Kit comes to the rescue. This kit contains two tank O rings, a snorkel keeper, a mask strap, and a fin strap. The kit is priced at \$3.50. Aqua-Craft, Inc., 3280 Kurtz Street, San Diego, Calif. 92110.



These are only two of the 23 dive oriented designs in T-shirts made by Dimension 2 for scuba diving enthusiasts. Designs are applied on top quality, 100% cotton T-shirts. Choose from gold, yellow, light blue, tan, and white. Comes in adult sizes small, medium, large, and X large. Priced at \$6. Available from Dimension 2, 8402-1 Magnolia Ave., Santee, Calif.



The SEADIVER® knife has a sure fitting, hand-contoured grip molded from soft, resilient plastic. The heavy duty stainless steel 6¾ inch blade features a serrated cutting edge and has measuring increments up to six inches. It sells for \$18.25 and is available from Healthways, 5340 West 102nd Street, Post Office Box 45055, Los Angeles, California 90045.



This optical viewfinder utilizes a series of lenses. Framers masks that indicate the picture area taken are included for the following sizes: 28, 35, 50, and square 126/movie format. Viewfinder sells for \$39.95. Additional framer masks for 17, 20, 24, blank, \$7.95. Ikelite Underwater Systems, 3303 North Illinois Street, Indianapolis, Indiana 88100.



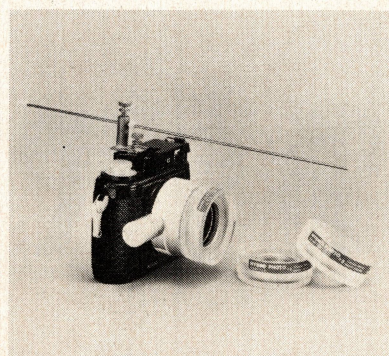
Garb and Gear Bags are for the discriminating diver. These efficient bags were designed with equipment carrying problems in mind. They are constructed of mildew resistant, 70 mil, expanded vinyl with 100% nylon backing. They come in black and sierra. Prices range from \$5 to \$40. Pennform Plastic Products, Inc., 365 Mulberry, Wyandotte, Michigan 48192.



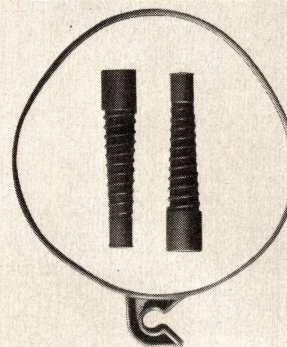
Warm up in a COLD DUCK sweatshirt. Made of 92% cotton, it features a draw string hood, zip up front, fleeced lining and two roomy front pockets. Available in small, medium, large and extra large, it comes in navy blue only. It is priced at \$9.95. (Californians add 6% sales tax.) Churchill Products, 12525 S. Crenshaw Boulevard, Hawthorne, California 90250.



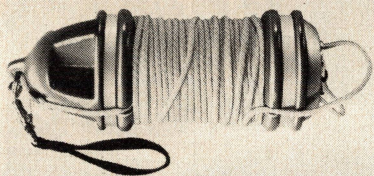
Here are dive watches for every budget. Each features a stainless steel case, luminous dial, autodate and movable bezel. They are depth tested to 400 feet and come with a two year unconditional guarantee. Priced from \$16.95 through \$49.95, they are available exclusively from Richard's Aqualung Center, 233 W. 42nd Street, Times Square, N.Y. 10036.



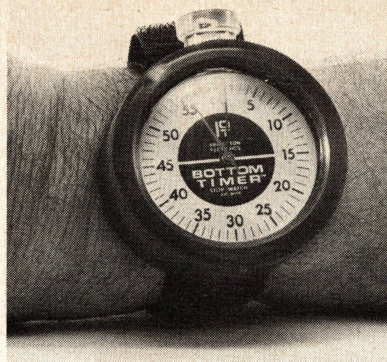
These three 35mm close-up lenses for subject distances of 4¾", 8½" and 15" are available for the Nikonos camera. They are made of optical glass so there will be no plastic between camera and subject. The lenses are interchangeable underwater and each one sells for \$40. Contact Hydro Photo, 3909 13th Avenue, South Seattle, Washington 98108.



Octopus rig hose holders and guards now come in bright red. Their distinctive color makes the extra second stage quickly identifiable even at great depth and with poor visibility. The price of the kit (one hose holder and two guards) is \$8.50 plus 75¢ for shipping and handling. Available from Glenn Beall Industries, 887 South Rte. 21, Gurnee, Ill. 60031.



The Marker/Recovery System™ is a neutrally buoyant, portable buoy to be used as a marker for items lost overboard, to pinpoint "hot spots," and for searches, surveys and emergency underwater communication. It carries 110 feet of 225 lb.-test tether line and has a non-drag anchor. It costs \$16. Write Pelican Products, P.O. Box 1511, Torrance, Calif.



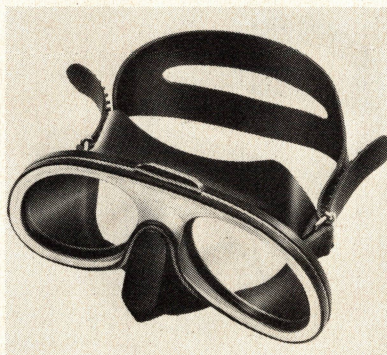
The BOTTOM TIMER™ is a stop watch which measures bottom time, activating at approximately seven feet. Housed in a Lexan® case with a rubber cover, it has a velcro strap or can be attached to an air hose. It is tested for water and pressure security to a depth of 300 feet. It costs \$49.95. Princeton Tectonics, P.O. Box CN 16, Princeton, New Jersey 08540.



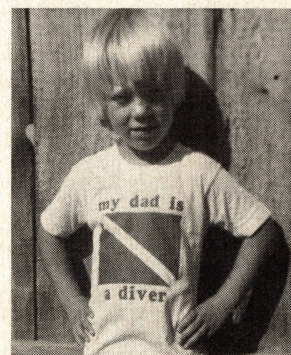
Here is a roomy changing tent for getting into and out of your suit at the beach or on those crowded dive boats. The heavy material provides warmth as well as comfort and privacy. The deluxe style is red terrycloth with hood, sleeves and pocket. It sells for \$33.50 plus \$1 handling. Available from Glenn Beall Industries, 887 South Route 21, Gurnee, Illinois 60031.



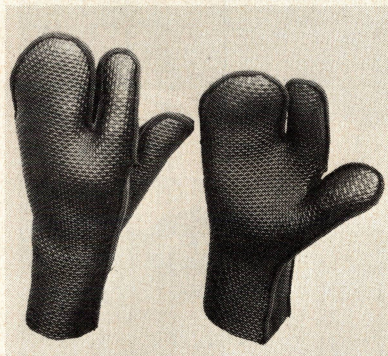
Gear can be marked permanently and easily with these new marking pens. They contain dye-type ink which has been especially formulated for rubber products. The markers come in five colors: red, silver, black, yellow and white. Each one contains 1/2 ounce and sells for \$2.25. Contact Global Mfg. Co., Post Office Box 15307, Milwaukee, Wisconsin 53215.



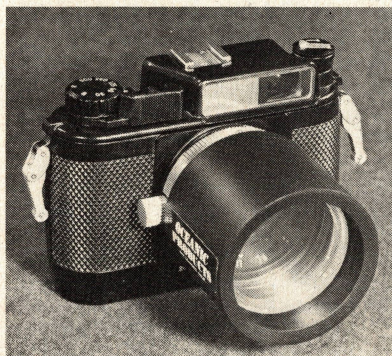
The Balboa Mask is designed for glove-fit comfort. It has a non-slip, split head strap for good balance and double edge skirt construction for a soft, perfect face seal. The low profile provides extended vision and the low interior volume of about 7 cu. inches provides clearing ease. This mask sells for \$18.95. AMF Swimaster, 3801 Harbor Blvd., Santa Ana, Ca. 92704.



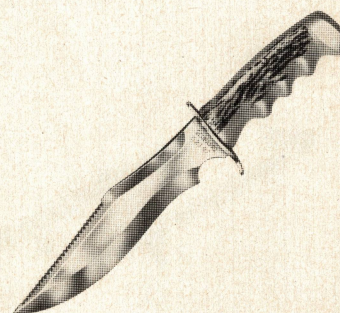
This 100% cotton T-shirt is pre-shrunk and has a bright red vinyl design. The colors won't run or fade. Children's shirts are \$4.95 plus 90¢ shipping and come in small, medium, large. Adult shirts are \$5.95 plus 90¢ shipping and come in small, medium, large, extra large. Somebody Else's Shirts, % Desert Reef, 1123 E. Sixth Street, Tucson, Arizona 85719.



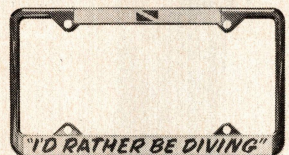
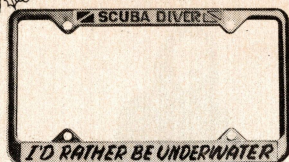
These long-cuffed, 3/16", three finger gloves are completely sewn. They have fewer seams which means added warmth, greater durability and better fit. The nylon inside makes them easier to don and the rugged pattern outside makes them abrasion resistant. They are priced at \$7.95. Harvey's, 2505 South 252nd Street, Kent Washington 98031.



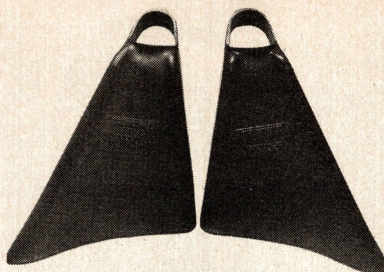
Photography buffs, now you can take sharper close-up pictures with an incredible depth of field. This slip-on close-up lens will provide a four inch depth of field when set at f22. The lens can be changed underwater which makes it very versatile. Priced at \$55, it is available from Oceanic Products, 814 Castro Street, San Leandro, California 94577.



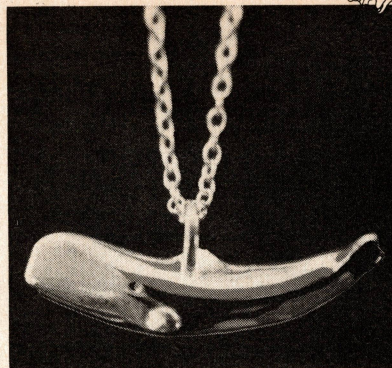
An attractive bone-like handle with contoured grip enhances the safe use of THE Knife. It is manufactured of super hard stainless steel, which keeps a sharp edge longer. Safe paring is possible using a special forefinger notch on the lower blade. Sheath included. Priced at \$30, it is available from Scubapro, 3105 East Harcourt, Compton, California 90221.



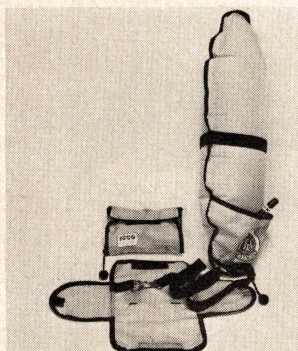
Identify yourself as a certified diver! These custom car license plate frames each feature diver's flags and are white with red wording. They are chrome finished metal and will fit any car. They make great gifts or club prizes and sell for \$3.49 each or \$6.49 a pair. Available from Shuttleworth & Company, Dept. 7, Box 231, West Covina, California 91793.



These fins with floating rubber construction are great for snorkeling, body surfing or just swimming. Regular blades sell for \$19.95. Stiffer blades, for more power, are priced at \$23.25. Californians add 6% sales tax. Please specify shoe size when ordering. Available from Churchill Products, 12525 South Crenshaw Boulevard, Hawthorne, California 90250.



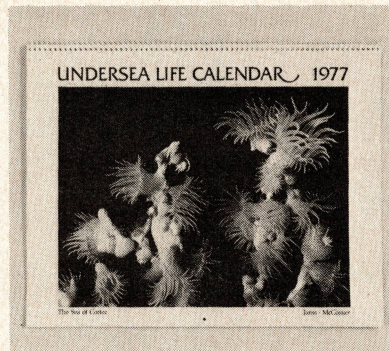
This is the latest in ecological jewelry — a necklace featuring a sterling silver miniature of an endangered species, the California gray whale. It comes with a 15 or 18 inch chain and is priced at \$37.50. This pendant is the perfect gift for the diver concerned about life in the sea. From Nathaniel, 3399A Mt. Diablo Boulevard, Lafayette, California 94549.



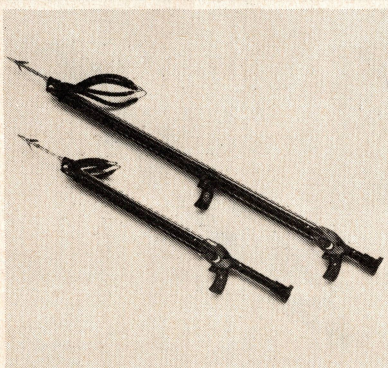
The Torpedo Float is an inflatable which can be used as a surface float, marking buoy and for light weight lifting. It folds into a compact pouch which can be worn on a weight belt or harness strap. It can be inflated manually or with a CO₂ cartridge. It sells for \$29.95 and it is available from Seatec, 427 West Palmyra, Orange, California 92666.



The Scubaview® mask has a new and unique design which results in wider vision. It features a divided head band and large purge valve. It is made to fit most size and shape faces. The mask is constructed of durable weather resistant rubber. It is priced at \$14.75. Healthways, 5340 West 102nd Street, P.O. Box 45055, Los Angeles, Ca. 90045.



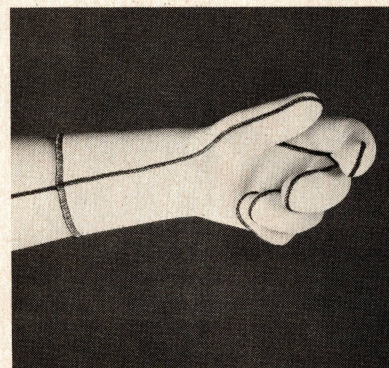
Undersea Life is a high quality, spiral bound 1977 calendar. Each month features a different underwater scene photographed in living color by Edwin Janss, Jr. The date squares provide ample space for notations. An inspiration to any U/W photographer, it sells for \$7.95. It is available from San Francisco Book Co., Inc., 2311 Fillmore St., San Francisco, Ca.



The Mini and Maxi Canon Arbalete feature all stainless steel trigger mechanisms housed in contour metal grips. The Maxi Canon also has a center stabilizing grip for greater accuracy. The Maxi Canon Arbalete sells for \$49.95 and the Mini Canon is priced at \$37.95. Available from U.S. Cavalero, Inc., 3186 Airway Avenue F, Costa Mesa, California 92626.



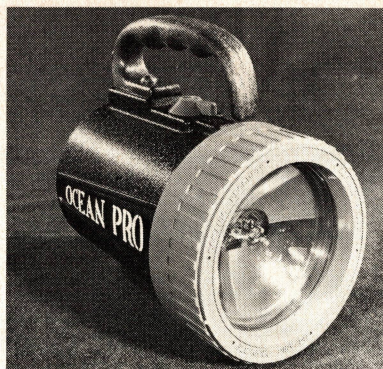
The Expediter is a red and black, laminated plastic tag with the diver image, designed to expedite delivery of lost gear, in the event it does not arrive with you. The write-on design tells who you are, where you're diving, with instructions to forward immediately. \$1.50 each or 4 for \$5. Aquatic Engineering Research, Inc., P.O. Box 364, Medford, N.J. 08055.



The Grabber nylon glove is thin for optimum sensitivity and carefully contoured to cling. The seams are primed, double glued, lock stitched and bar tacked. The Grabber is nylon on both sides. It comes in black or blue in 1/8 and 3/16 inch. Priced at less than \$20, it's available from Parkway Fabricator, 241 Raritan St., South Amboy, N.J. 08879.



A gift for the diver who has everything. This belt buckle, featuring the distinctive emblem of a well-known dive equipment manufacturer, is a subtle way of letting everyone know he's a diver. The pewter alloy buckle is heavy weight and fits a 1 3/4 inch belt. It sells for \$6 and is available from Scubapro, 3105 East Harcourt, Compton, California 90221.



The Ocean Pro is a modular lighting system which uses a six volt lantern battery. This non-rechargeable version can be changed to rechargeable in 60 seconds. The body is a non-corrosive space age material which will withstand years of rugged use. The hand light is priced at \$29.95. Oceanic Products, 814 Castro Street, San Leandro, California 94577.



This two chambered diver's float can support up to three divers. The top chamber holds air for buoyancy while the bottom chamber holds water for ballast. It displays the diver down flag prominently and is made of heavy duty vinyl for long life. Great for beach dives. Priced at \$33, it is available from Dacor Corporation, 161 Northfield Road, Northfield, Ill. 60093.



This wide angle adaptor for use with all SR 2000 strobes increases the beam angle to 80 degrees underwater and 100 degrees topside. It snaps on and is easily attached or removed underwater. The lens is acrylic and the rim is injection molded EBS. It sells for \$12 and is available from Sonic Research, 5111 Santa Fe Street, Suite H, San Diego, California.



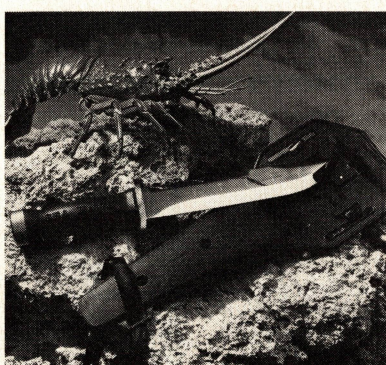
The 1976 Depth Master II Gauge is an oil filled bourdon tube depth gauge. The luminescent two inch dial reads to 250 feet. This low profile gauge comes with a 14" heavy rubber strap. The anodized aluminum case provides for a maximum of shock resistance. The Depth Master II is priced at \$43.95 and available from the Aqua-Lung® dealer in your area.



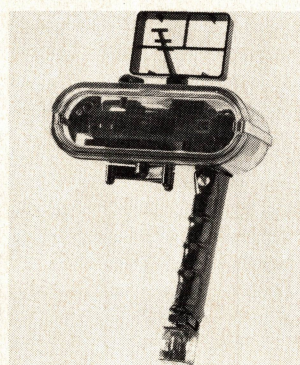
These equipment bags are made of tear resistant Herculite®. They feature wraparound two inch nylon straps and zippers which can be locked. The 26" by 14" model sells for \$21.95. The smaller 21" by 10" version is ideal for those divers who travel and is priced at \$15.95. Available from Dacor Corporation, 161 Northfield Road, Northfield, Illinois 60093.



The Fara Fin II is the first large fin which features a self-adjusting stainless steel spring strap. It has a molded neoprene heel pad for comfort. Because there aren't any buckles or straps to adjust, this fin is easy for the diver to put on and take off. It sells for \$37.95. It is available from Farallon Industries, 1333 Old County Road, Belmont, California 94002.



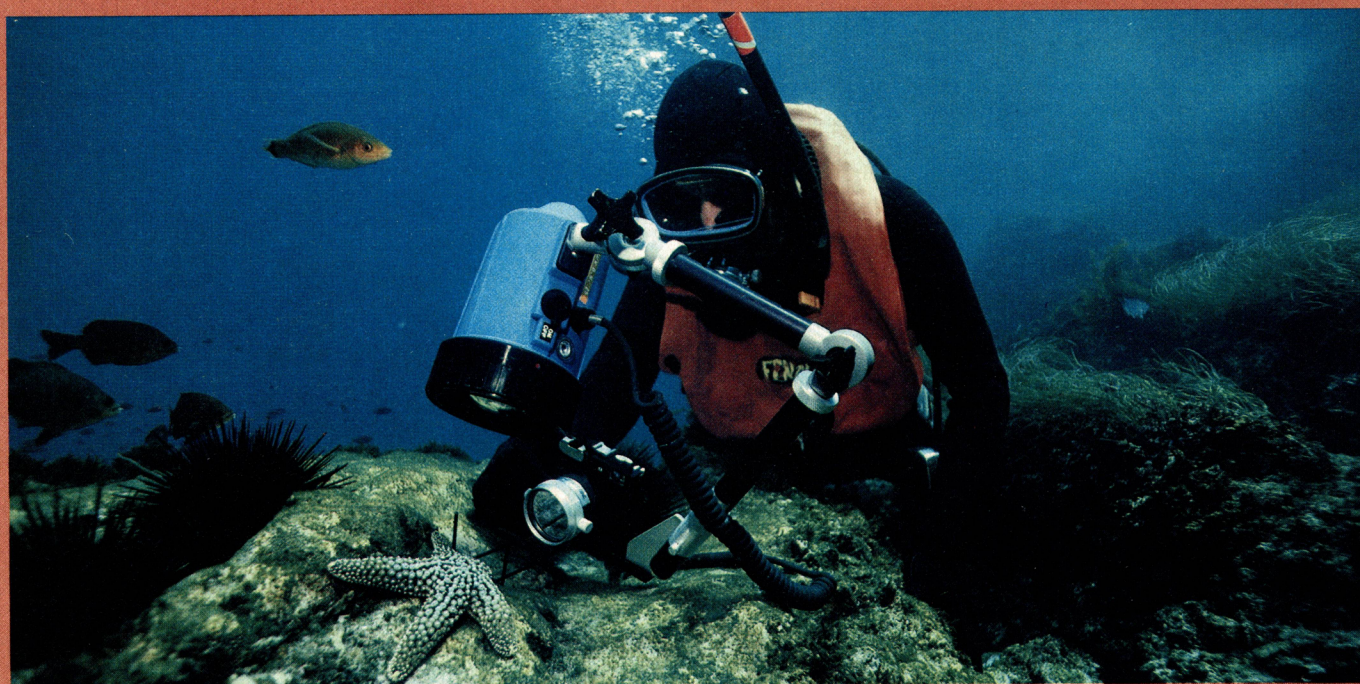
The Sea Hawk knife features a high carbon stainless steel blade which is rust and corrosion proof. This heavy duty blade is 7 1/2 inches long, serrated, and has six inch measuring scale. The molded rubber, easy grip handle has a solid metal, hammer type butt cap. Complete with sheath, the knife sells for \$27.95. Available from the Aqua-Lung® dealer in your area.



The Ikelite Trimcases are designed for pocket cameras. They offer foolproof sealing to depths of 300 feet. A single control operates both the camera shutter release and film advance. Focus control is also provided. Handle and U/W flash unit included. Ten models are priced from \$39.95 to \$49.95. Ikelite U/W Systems, P.O. Box 88100, Indianapolis, Ind. 46208.

SECRETS OF CLOSE-UP PHOTOGRAPHY

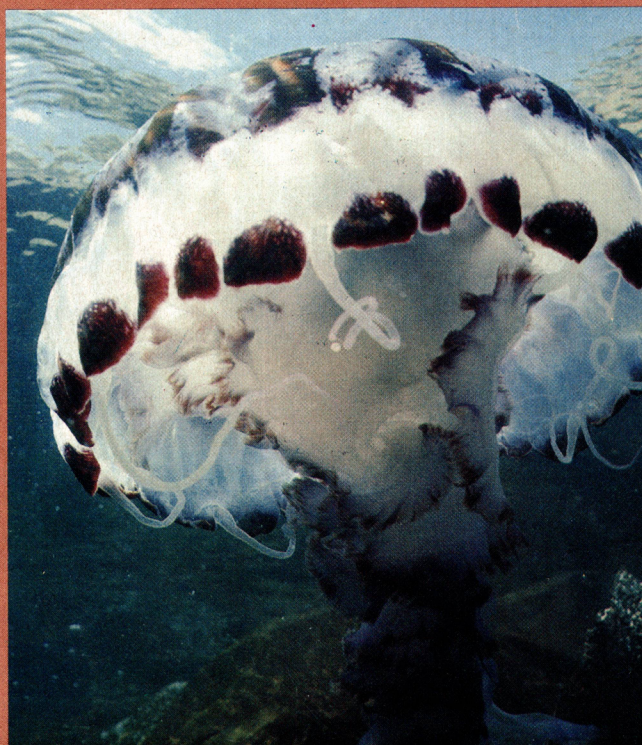
By Emerson Mulford, Jr.



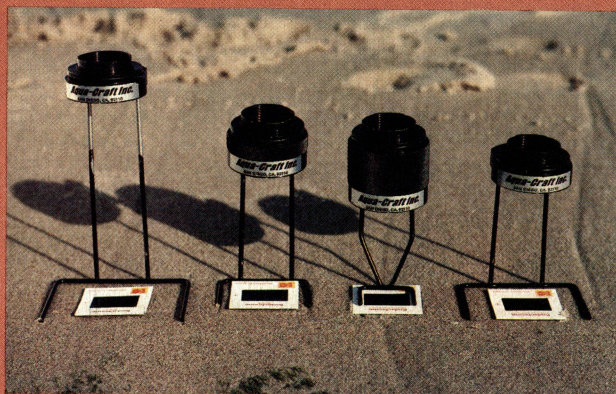
Several years back, when first becoming interested in underwater photography I had the fortune of meeting a fellow diver who was both a photographer and a marine biologist. We met while on a two day boat trip to Catalina Island off Los Angeles. After a full first day of diving this new friend, Rick, and I were relaxing over dinner and a bottle of wine. I innocently made the comment that Southern California didn't seem to have much colorful marine life. With that I nearly caught what Rick was chewing. Following a very gestured laughing seizure and two quick glasses of wine (including what was left of mine) I was again nearly blown over with, "What! Sixty million colorful things crawling around out there and you sit here telling me there isn't much colorful marine life!"

Needless to say, the verbal abuse which followed during the next hour was exhausting. There was, however, a positive conclusion. Having no scientific knowledge with which to combat this attack, I was left no other escape but to give him the old, "oh yeah, well show me."

He did. Early the next morning he had me 25 feet deep in the middle of a kelp bed and — you guessed it. He pulled the old flashlight trick on me. In the hour that followed we briefly blinded at least 20 colorful fish I'd never before seen, at least



From left to right are Aqua-Craft extension tubes, 1:1, 1:2, 1:3, for the 35mm lens and the 1:2.75 for the 28mm lens. The slide in the framer illustrates the area that is being photographed by each individual tube.



photography by Author



200 strange and colorful invertebrates which I had previously thought dull, and several moray eels which I didn't want to see at all. Most of these animals had little or no visible color until illuminated with an artificial light source and none could be seen while simply swimming along and looking down.

Now you might be asking yourself what all of this has to do with you. Well, if you're a budding underwater photographer looking for something new and challenging, you can stop looking. You've found it. Close-up photography offers the potential for more control, and thus more creativity, than any other specialty in underwater photography.

1:10 through 1:1

Now that you have found it, let's give it some universally accepted names so that in the future we all have a common ground. There are really two subdivisions of what is called "close-up photography." They are described in terms of magnification and are delineated by specific reproduction ratios.

To best describe these two subdivisions we'll start at the far limit of close-up photography and work in. The term close-up generally encompasses film-to-subject distances of less than ten times the focal length of the lens being used. Thus, if you

are using a 50mm lens shooting distances of less than about 20 inches would be technically defined as close-up photography. This distance often coincides with the minimum point of focus of most normal lenses supplied with cameras.

In terms of magnification this minimum focus point generally covers down to the reproduction ratio of 1:10. Simply put, this 1:10 ratio means the image on the film, if measured, would be one-tenth the size of the real object. The far limit of close-up photography begins, then, where a normal lens leaves off. Reproduction ratios from 1:10 through 1:5 make up this first subdivision.

Moving still closer, the second subdivision ranges from a reproduction ratio of 1:5 through 1:1, and is referred to as extreme close-up photography. At the 1:1 ratio image size on the film equals the actual object size and is often referred to as life size photography.

Beyond 1:1, through 25:1, lies the technique or field of macrophotography. Beyond macro is photomicrography. Both of these areas are recognized as specialized sciences and therefore require highly sophisticated laboratory type camera and lighting equipment.

Having conceptually defined our working area, let us now

move on to more specific areas within close-up photography. As mentioned earlier, most normal lenses supplied with your camera rarely focus closer than 24 inches. Shooting close-ups at 24 inches just doesn't work. Subjects appear too small. The need to shorten the standard lens and thereby get closer to your subject becomes obvious. If you're using a Nikonos camera with the 35mm lens (which is actually 47mm underwater)

"Green Things" Close-up Lens Specifications

Close-up lens used	Focus setting	Focused distance	Picture area	Near & far limits	Depth of field at f22
+2 diopter	2.75 feet infinity	12" 19½"	6" x 9" 9¾" x 14"	10½" to 15" 15½" to 28¼"	4½" 13¾"
+3 diopter	2.75 feet infinity	9" 13"	4¼" x 6¾" 6¼" x 9¾"	8¼" to 10¾" 10¾" to 16½"	2½" 5¾"
+4 diopter	2.75 feet infinity	7¾" 10"	3½" x 5¼" 4½" x 7"	6¾" to 8½" 8½" to 11½"	1¾" 3"

the easiest method of achieving this is through the use of positive supplementary lenses, or close-up lenses. These are positive diopter lenses that, when attached to your standard 35mm Nikonos lens, shorten the focal length thereby allowing a sharp focus at closer distances and thus much larger images. These lenses are described numerically with the larger numbers denoting closer focus.

There are a variety of inexpensive diopter type close-up lenses available. Perhaps the least expensive are the "Green Things" offered by Aqua-Craft, Inc. of San Diego. These lenses are available in +2, +3, and +4 powers. The accompanying chart describes the point of focus, picture area, and depth of field of these lenses when used with the standard 35mm Nikonos lens.

Actual use is quite simple. The lens merely snaps onto the front of your 35mm Nikonos lens. The lens is focused at the indicated distance and you shoot from the waist. By doing this, you will minimize the only problem encountered when using close-up lenses, that of correctly judging the shooting distance. Using this method forces you to look down upon the subject and the camera together. Guessing distances in this way is much easier.

Another method of overcoming this problem is through the use of a measuring wand. This simple measuring wand, available from Aqua-Craft of San Diego and HydroPhoto of Seattle, adjusts for the +2, +3 and +4 lenses. It attaches to the accessory shoe of the Nikonos camera and correctly illustrates the correct point of focus desired.

Choosing the correct film for close-up photography is quite simple. You determine the film relative to the aperture f22 and your light source. For example: with a Subsea MK100 at full power and ASA 64 film, you have a guide number of 24. Thus an approximate one foot shooting distance of f22 would be used. ($24 \div 1 = f22$) With an Oceanic 2001 strobe and ASA 25 film, your guide number is 22, a one foot shooting distance.

The point to be made here is twofold. First, you want to use the smallest aperture possible, thereby maximizing depth of field. Secondly, using a strobe-to-strobe distance of one foot is convenient to remember and also allows even light dispersement. Extremely close light-to-subject distances often cause too much contrast and therefore the loss of shadow detail.

Approach is important too — never shoot down! Always attempt to shoot horizontal or even slightly upward. Shooting down denies a foreground and a background — both important elements of composition. The loss of one or both will result in a picture that appears flat and without dimension.

Extension Tubes

An alternate method of achieving close-up photography is

through the use of extension tubes. As the name implies, an extension tube is merely a mechanical device, as opposed to optical, that shortens the focal length of the lens, thereby allowing much closer focusing.

Being mechanical, extension tubes fit between the lens and camera body. If you're using a 35mm SLR camera in a housing, the particular manufacturer of your camera will have a variety of tubes available. Because your system utilizes reflex viewing, choosing the correct tube length for your needs will be a visual matter. However, more on this a little later.

If you're using the Nikonos system, there are several sources for extension tubes. Aqua-Craft, Inc., of San Diego, Oceanic Products, and Subsea Products all make extension tubes.

Reproduction Ratio

Extension tubes are described by their image to object or reproduction ratio. As earlier mentioned, this ratio describes the size relationship between the image on the film and the real object. Generally these ratios are: 1:3, 1:2, and 1:1, three tubes in all for the 35mm lens. There is also a 1:2.75 for the 28mm Nikonos lens.

Exposure with extension tubes is not quite as simple as with the diopter type close-up lenses, but nearly so! As the shooting distance decreases, and the image size increases, recomputation of exposure becomes necessary. In the chart the reproduction ratio is shown with the necessary increase in exposure.

EXPOSURE FACTOR TABLE

Reproduction Ratio	Exposure Factor	Increase Stop
1:10	1.2	1/4
1:5	1.4	1/2
1:4	1.6	3/5
1:3	1.7	4/5
1:2	2.3	1-1/5
1:1	4	2

As you can see, at the outer limit of close-up photography with extension tubes, recalculation of exposure is nearly academic. However, at a reproduction ratio of 1:5, or where extreme close-up photography begins, ½ f stop and greater increases become necessary.

Another factor that begins to affect us here and at greater magnifications, is camera movement. The greater the magnification, the greater the camera movement appears. This can be likened to the same affect achieved when using the more powerful of telescopes and binoculars of greater magnification. Because of this inherent problem, a strobe light is recommended for all extension tube work.

Exposure for tubes can be quite simple. First, determine your strobe's underwater guide number. For purposes of example, let's assume with ASA 64 film a guide number of 24. Since we're going to be dealing in inches and our GN is in feet, we first must multiply our GN (24) times 12 to establish a new guide number in inches. Thus $24 \times 12 = 288$.

Secondly, since we want to use an aperture of f22 for maximum depth of field, we must divide our new inch guide number (IGN) in inches by 22 to determine our strobe-to-subject shooting distance, thus $288 \div 22 = 13$ inches. We're almost there! Now the exposure factor, say for a 1:3 tube, is 1.7 (refer to the exposure factor table). Divide 13 by 1.7 and you get approximately eight inches; your corrected shooting distance strobe-to-subject.

This method will put you very close to a correct exposure. Some variance may occur, but it will be very small.

One final area of close-up photography is SLR cameras in a housing. For those using reflex cameras, there are a variety of macro lenses available, both from camera manufacturers and accessories' companies. These are special lenses capable of

focusing from infinity to a 1:2 reproduction ratio without the addition of extension tubes. Examples of these lenses for the different cameras would be: the 105mm Nikon macro lens; the 100mm Canon lens, and the 55mm Vivitar lens, adaptable to any SLR camera. If you're using reflex equipment, get one! These lenses are sharper than normal lenses, being specially designed for this range of magnification.

In choosing one of these macro lenses, look to the longer focal lengths, for example 100mm. These will allow at 1:2 reproduction ratios, shooting distances of 10 and 12 inches camera-to-subject.

If possible, use a flat port rather than a dome port. This will increase your focal length by a factor of 1.3, the refractive index of water, again enabling you to shoot high magnification photos at less disturbing distances to your subjects.

Composition and Lighting

There are many elements that go into making a good com-

we perceive appears so because of infinite associations between light and dark. The more aware you become of light and its ability to wrap around or fall off objects, the more capable you will be at rendering a round object round or an angular object angular.

If you're using a single strobe source, first decide the best angle for viewing, then place your light so that 2/3 of that area in front of the lens is receiving light directly — 1/3 indirectly. This can be done by modeling the light overhead or off to one side. The subject will tell you the best angle. If the composition is diagonal, let your light fall off along this diagonal. This particular technique will give the diagonal an appearance of fading with distance.

Two light sources lend even more potential for creativity. The many shadows that single light sources create may be subtly filled in with two or even three strobes. (A buddy team can accomplish much with very little practice.) Remember though — subtle! Even lighting ratios of 1:1 produce flat ap-



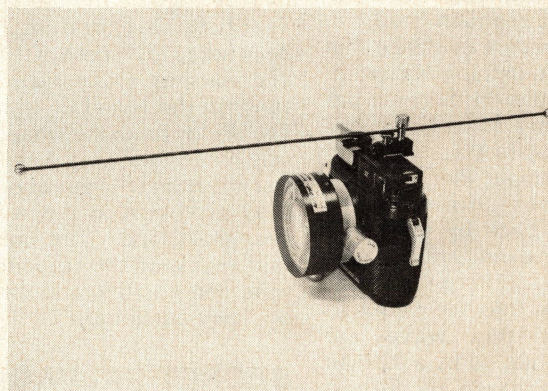
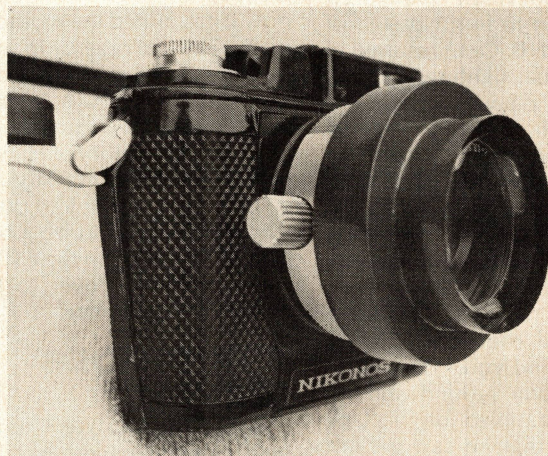
Above are three diopter type close-up lenses that are available from Aqua-Craft. These lenses are available in +2, +3, and +4. Actual use is simple. The lens merely snaps onto the front of your 35mm Nikonos lens. To overcome the problem of misjudging your shooting distance, you can use a measuring wand like the one pictured on the right. It adjusts for the +2, +3, and +4 lenses. It attaches to the accessory shoe of the Nikonos camera and correctly illustrates the correct point of focus desired.

position. Subject location within the frame, just the right amount of foreground, not too much depth of field, etc. All are individually very important.

However, if one were to pick the single most important element, lighting technique would be my choice. Lighting is the prime key to color saturation and the contouring of your subjects. Inadequate lighting renders even the most brilliant compositions drab and flat in appearance.

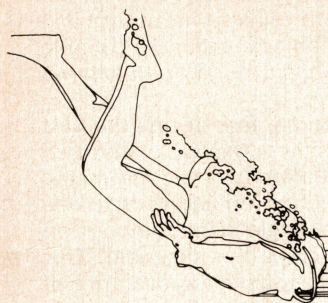
Previsualization

Improving your technique is easy. You don't even have to be underwater. View things, people, buildings, everything, with an inquisitive eye. Be constantly asking yourself why this "thing" appears so round, or that building so angular. All that

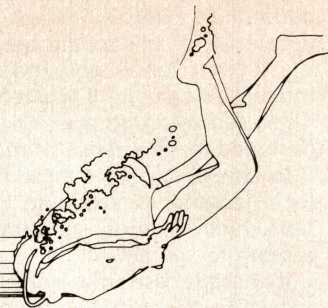


pearing subjects. Ratios of 6:1 or 8:1 produce overly dramatic effects, such that subjects often become abstract. A ratio of 3:1 is perhaps the best, producing good shadow detail, yet lending itself to contoured subject. Also important, this ratio works well with both black and white and color film.

Whatever your technique, do not employ it randomly. Develop your subject first, the approach second. Many photographers go to extremes developing a technique, only to find it inadequate for the subject they've found. Pre-plan your photo dive. You and your buddy should know what it is you're seeking, the probable location, whether or not you should move it, and what the probable approach and lighting techniques will be. Done in this manner, you're likely to avoid the verbal abuses one can suffer from a seemingly innocent statement made to biologist avant garde — Good luck! 🐠



News Briefs



By Hillary Hauser

NESSIE NEWS

The American sponsored expedition to film Nessie last summer (NB, Oct.) resulted in some actual sightings, but not near the camera operation. One of the sightings was by Charles Wyckoff, an American scientist specializing in photographic technology. In the middle of an interview with a Scottish radio reporter on the shore of Loch Ness, Wyckoff remarked casually, "... And there's the beast right behind you." The interviewer spun around and reportedly gabbled into his tape recorder that he saw a "fast moving black blob which resembled a reptilian head."

Other recent evidence that there is something big swimming around in the loch has come from a sonar boom suspended against a small jetty called Temple Pier. At least four times sound waves bounced back by the sonar device have indicated the presence of a large animal swimming into the Urquhart Bay. The sonar waves are being monitored by a 12 man team organized by Robert Rines, president of the Academy of Applied Sciences, Boston. Rines led teams into the loch in 1972 and 1975, and came out with the most convincing Nessie pictures to date. Skeptics, however, say the dark outlines in Rines' photos could just as well be "bagpipes or other items" discarded in the loch.

GLOMAR MOTHBALLED

No one grabbed the *Glomar*

Explorer when the big ship went up for rent (NB, June), so now it has joined the mothball fleet. The salvage ship was built by Howard Hughes and was used by the CIA to raise the remains of a Soviet sub from the ocean floor of Hawaii in 1974. The rental figure, guessed to be about \$30,000 a day, didn't seem to be a bargain to anybody, so the 618 ft. ship was turned over to the Navy last September.

TORPEDOES FOUND

Live torpedoes were found on a sunken Japanese warship in Truk Lagoon and the Trust Territory Government has been asked to dispose of them. The warship, *Gosie Maru*, is sunk off the island of Uman. The discovery of the weapons was made following a report last July from villagers about a loud explosion in the water near the island. Truk police said many of the torpedoes were deteriorating and could be "very dangerous."

SECRET SALVAGE

A Soviet reconnaissance plane went down with its crew off the Canadian coast last August and the Russians have since been trying to recover sensitive equipment from the wreck. A news report sent to us by reader Ted Lyman indicated that the TU95 Bear crashed into the sea en route back to Russia after 19 days in Cuba and that Canadian officials announced the crash. The Russians are staying quiet on the subject.

HISTORIC FIND

The 1779 wreck of the *Bonhomme Richard* has been found off England by marine archaeologist Sydney Wignall. The Revolutionary warship, object of a three country (U.S., France, England) cooperative search (NB, Aug.), lies in 150 feet of water off England's northeast coast. In 1779 the *Bonhomme Richard* was fighting a three and a half hour battle with the British warship *Serapis* when it began to sink. Jones was asked to surrender but he uttered the now historical words, "I have not yet begun to fight." He brought the *Bonhomme Richard* alongside the *Serapis* with grappling hooks, stormed and captured it, then his own ship sank.

MONITOR LIFT?

The *USS Monitor* could be lifted from the ocean floor within 10 years, using a ship such as the *Glomar Explorer*. That's the feeling of Dr. Robert E. Sheridan, a U. of Delaware oceanographer who, with John G. Newton, located the Civil War ironclad two years ago in 220 ft. of water 16 miles south-southeast of Cape Hatteras. Newton, however, was cautious on the point, stating much research remained to be done before such a feat could ever be attempted. He felt that if the ship were raised it would never be lifted entirely out of the water because of subsequent exposure to corrosive air. Instead, said Newton, the ship could be lifted to shallow water where scuba diving researchers could study it. Last

year, the *Monitor* was declared the nation's first marine sanctuary. At present, Duke U. scientists aboard the *R/V Eastward* are making a survey of the site with a magnetometer which will hopefully reveal the location of larger buried iron parts, (anchors, cannons, etc.). Sheridan, who is a member of the Monitor Research & Recovery Foundation, recently commented, "With our engineers, marine archaeologists and naval historians, we have formulated a six phase plan which, if possible, will lead to the recovery of the *Monitor*."

Those interested in becoming a member of the Monitor Rescue Team (\$5.00), write: P.O. Box 1862, Beaufort, N.C. 28516.

BAD DAY AT SEA

In September, an American F-14 Tomcat fighter and its highly secret Phoenix radar missile system sank 1890 feet to the bottom of the ocean off Scotland. The plane slid off the aircraft carrier *John F. Kennedy* during a NATO exercise in the North Atlantic when the throttle in one engine jammed. A salvage operation was immediately initiated and the plan was for Seaward Inc., of Falls Church, Va., to assist in the underwater recovery. Seaward, which has salvaged several hundred aircraft for the armed forces over the past ten years, felt that if the F-14 reached the bottom in one piece it could probably be recovered intact.

(P.S. Ten hours after the F-14 slid over the side, the

Kennedy collided with the U.S. destroyer *Bordelon* during a refueling operation.)

DIVE-A-THONS

This year, several diving marathons were staged to raise money for various national organizations. Notables were an U/W swim across the Catalina Channel (Sept. 5) to raise money for the Jerry Lewis Labor Day Telethon for muscular dystrophy, and a 1008



\$3000 for Park Place . . .

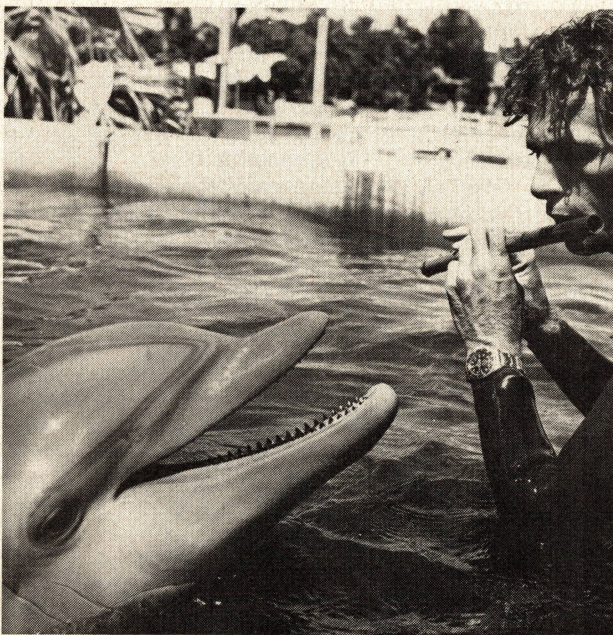
hour U/W Monopoly game (July 23) for the March of Dimes. The Monopoly game was staged by members of the Lodi (Calif.) Diving Club, and raised \$3000 from local citizens and businesses. It broke the previous world record of U/W Monopoly of 501 hours.

NEW LAB

Plans for the new Mote Marine Lab on City Island, Sarasota, have been finished, and ground breaking for the 9600 sq. ft. building took place in October. Construction will take eight months, with moving day planned for next fall. The new MML will have a natural lagoon for large marine animals, four 15 ft. concrete tanks for the smaller critters, aquarium rooms, equipment rooms, labs and of-

O'FELDMAN: "WE'LL STOP THE WHALING PROBLEM THIS YEAR"

Greenpeace, long in the news and now the subject of a Hollywood film, is the group that puts itself between the commercial hunters and their prey (seals, whales, dolphins) in order to stop the killing (NB, June). This summer, Greenpeace launched the converted minesweeper *Greenpeace VII* from Vancouver, B.C. to confront a Soviet whaling fleet reported west of Hawaii and heading toward California. They intercepted the Russians 1400 miles southwest of San Francisco and in small rubber rafts placed themselves in front of a pod of sperm whales, allowing the mammals to escape.



O'Feldman, playing for *Flipper*, appealing to the Japanese . . .

Optimism has since come from an even broader front. This year, the Dolphin Project, a branch of the World Dolphin Foundation (Florida), sponsored a rock concert at the Coconut Grove in Miami called the Rolling Coconut Revue. Proceeds were used to send Ric O'Feldman to Japan in a Greenpeace effort to appeal to both the Japanese and Russians. O'Feldman, who trained Flipper for the *Flipper* television series, talked to the Japanese, using the extreme popularity of the rerunning *Flipper* series to appeal to consciences. O'Feldman was optimistic in September, "Joni Mitchell is coming here to help. They love Flipper. I really believe we are going to stop the whaling problem this year."

fices. A Marine Science Education Center is also planned, as soon as funds are available.

GREEK FIND

In Athens, U.S. ar-

chaeologists have dug up what may be the largest mosaic ever found in Greece — a black and white bathhouse floor depicting an undersea fantasy world. The

mosaic was part of a first century A.D. Roman bath at Isthmia, near Corinth, and was part of a sanctuary to the sea god Poseidon.

Paul Clement, professor of classical archaeology at USC and director of the excavation, said the mosaic measures 20 by almost 8 meters. Made of black and white marble, the floor shows a watery world of Nereids (sea nymphs in mythology) riding ichthyocentaurs — sea monsters with men's heads, wings or horse's forelegs and long sea serpent tails. The baths were part of the facilities for festivals at the Poseidon sanctuary where the Isthmian games were staged.

DISAPPEARING ACT

Airport 1977, another theatrical spinoff from the original disaster flight, went into production in September. In this episode, a jet passenger plane disappears in the Bermuda Triangle.

ODDS & ENDS

Oasis in Space, a new Jacques Cousteau series of six environmental specials, began to air on PBS this fall . . . Reader Rick Vandenberg writes that his club, the Grand Valley Scuba Divers of Grand Rapids, Mich., is joining the Michigan Dept. of Natural Resources to help show boaters the importance of the diver's flag. DNR officials have found that many boaters don't know what that red and white flag means . . . Another liberty ship has been sunk in the Gulf of Mexico, this one for Alabama's offshore artificial reef program. The reef, 15 miles off Dauphin Island, already had four other ships . . . *Shark Bait* is a comic takeoff on *Jaws* that was trying to get in the Hollywood swim last fall. We'll let you know what it's about when we hear . . . Meanwhile, Merry Christmas!

BOTTOM TIMER

The First Automatic Underwater Stopwatch

By John Columbia

Each year many divers suffer varying degrees of decompression sickness. Most cases go unreported, or are so mild that they are actually unnoticed, but all have one common factor: for some reason, those divers who get bent are unable or unwilling to keep track of their bottom time. The reasons are diverse: many divers do not learn the importance of diving within the safe limits for decompression; maybe a good dive watch is out of reach of their budget, or perhaps goes unworn for fear of loss. Now, a new company has an inexpensive answer to many of these problems.

That answer is called the Bottom Timer and is the product of a long search by Bill Stephens, president of Princeton Tectonics and a New Jersey dive store owner. Bill has been an avid East Coast wreck diver for many years and because most of the eastern wreck diving is done in deep water (80 to 200 feet), keeping accurate track of bottom time is especially important. And, as Bill will tell you, it is a pain in the crotchstrap to try to set the bezel on your watch off the turbulent New Jersey coast while hanging onto an anchor line with your hands full of lights, lift bags and tools.

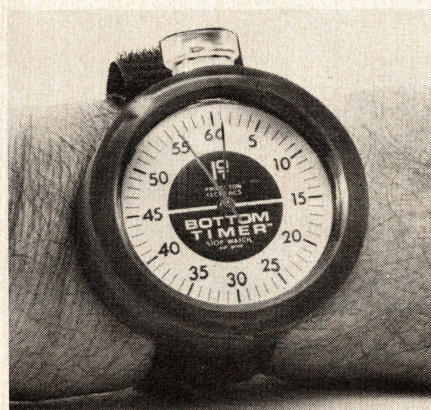
Dive watches and their rotating bezels are not the answer for the type of serious diving Bill and his customers were doing. Besides being expensive for the diver on a shoestring budget, dive watches are expensive to lose. What Bill wanted would have to be self activating, rugged and inexpensive with no bezel to get knocked out of calibration.

The result of Bill Stephens' efforts is the Bottom Timer. In essence, the Bottom Timer is an automatic underwater stopwatch. The Westclox mechanism is activated by water pressure against a neoprene diaphragm. This releases a lever against the flywheel of the watch. It is encased in a tough plastic housing chosen to withstand shock and abuse and is factory tested to a depth of 300 feet. The finished product in its rubber outside casing weighs less than many top of the line

dive watches and sells for only \$49.95.

In field tests, our Bottom Timers performed quite well. My instrument activated at a depth of five feet, while Nancy Ackerman's began to record at about ten feet. Princeton Tectonics strives for an average of seven feet of depth before the timer activates. We've encountered one Bottom Timer owner whose instrument activates in 16 inches of water. Certainly this mechanism is sensitive enough for even the most discriminating diver.

The velcro strap deserves some mention. Straps in general are difficult and hard to adjust for fully dressed divers, not to mention their tendency to rot if they are made from rubber. The velcro strap



Automatically activated when a diver submerges, Timer shows elapsed time of dive.

that comes with the Bottom Timer makes it a simple matter of laying the instrument over your wrist, sticking the free end through the wide buckle and pulling it back against itself until it is tight. Adjustment during the dive, necessitated because of wet suit compression, is just as easy. If you are a diver who prefers to place your instruments in a console, the Bottom Timer will fit comfortably in the area used by a decompression meter. I wear my Bottom Timer attached to my high pressure hose with an optional gauge mount available from Princeton.

During our dives, Nancy and I made repeated ascents together to test the accuracy of the timer and the activating diaphragm. At the end of the dives, our timers were never more than 20 seconds apart. This is because the red second hand does not reset completely when the minute hand is zeroed for the next dive. This difference is minor and not enough to cause a problem when using the repetitive dive tables.

After each dive, it is necessary to reset the Bottom Timer. This is an easy procedure that is performed by pulling out the crown and turning it until the black minute hand reaches zero. I found the crown on my Bottom Timer to be stiff, but this was easily rectified by gently rotating the crown back and forth until it slid out. Under no circumstances should silicone spray be used to lubricate the stem, as the case is made of Lexan®, an extremely rugged plastic that is unfortunately sensitive to some of the chemicals used in spray cans. The crown is double O ring sealed so the forgetful diver who dives again without pushing the crown in will not ruin his instrument. Additionally, this extra O ring means that the Bottom Timer can be reset underwater and used as a stop watch for training purposes, scientific research or timed swimming.

The Bottom Timer runs for approximately 30 hours continuously with one winding. The large wind knob allows a lot of leverage to be applied to the mechanism, and winding should be stopped when the knob offers greater resistance. This is much the same way you should treat the winding of your underwater dive watch.

This instrument seems to be a good answer to the bottom time problem. It is easily within the reach of most diver's pocketbooks and is cheap insurance for that nice dive watch you got for Christmas last year. If you cannot find it in your local dive store, write to Princeton Tectonics, P.O. Box 764, Hightstown, N.J. 08520 for the address of the dealer closest to you. 🐠

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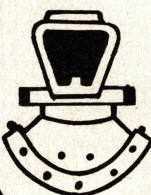
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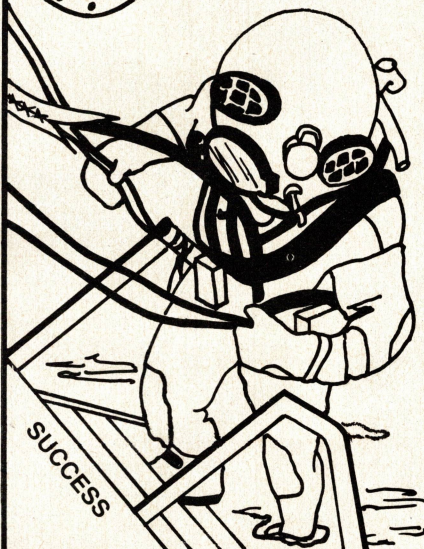
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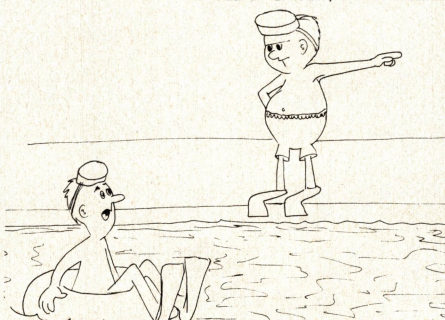
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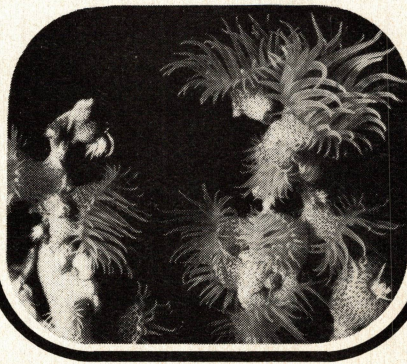
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Introduction and captions
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The Tarpon

(*Megalops atlantica*)

The generic name for the tarpon — *Megalops atlantica* — has a meaning which aptly describes it. *Megalops* is from two Greek words for mighty and to move, which indicates that the fish is a strong swimmer or fighter; *atlantica* means of the Atlantic ocean. The tarpon is one of the most popular game fishes of the world, leaping eight to ten feet out of the water when hooked. It is a big, silvery fish that can grow to more than eight feet and a weight of 350 pounds. Its jutting lower jaw and turned down mouth make it a tough looking animal. □ Ichthyologists note that the tarpon is one of the most primitive of fishes. It belongs to the subclass teleostei ("true bone") — with ventral fins on the belly and no spines in the fins. Other teleosts of the primitive type are the herrings and salmons. The tarpon is further classed under the order Isospondyli, which includes the herring-like fishes, and it is believed that all the rest of the bony fishes descended from this. The tarpon family is the Elopidae, which also includes the ladyfishes. Both tarpons and ladyfishes are large, strong, silvery fishes which are popular with anglers. They live in both salt and fresh water — in warm, shallow coastal waters, mangroves, estuaries, in rivers and canals. They can live in very stagnant, brackish water and apparently they can do this because their swim bladders have an open connection with the gullet and are modified for taking in air. Fishermen can spot them as they roll at the surface to breathe. □ The tarpon is widely distributed on both sides of the Atlantic and in the western Atlantic is found from Cape Cod to Brazil, chiefly in the Caribbean, off Florida and in the Gulf of Mexico. It will migrate as far as Nova Scotia, but

only during warm months, since it prefers warm, tropical waters such as the bights of Andros, Great Bahama Bank or around Bimini. The tarpon spawns far offshore or at least where currents can sweep the eggs out to sea. The females have many eggs; one individual weighing 142 pounds contained about 12 million of them. The eggs pass through what is called the leptocephalus stage, when their bodies are ribbon-like, transparent or translucent, like the eels. They do not resemble the adults at all, except for the characteristic forked tail. The leptocephali of the eels

have rounded tails. In the larval state they drift to shallow marshes, mangrove swamps or ponds and then begin the metamorphosis into the adult phase. The juvenile tarpons eat copepods, aquatic insects and small fishes. The adults feed primarily on crustaceans and fishes, the grunion-like silversides being their

major prey. They have been known to swim into a school of small fishes and attack simultaneously side by side, which Randall thinks may increase the efficiency of their feeding. They usually swim into shallow bays to feed, chiefly at night. □ It is not a particularly rare occurrence that a diver will see the tarpon underwater. The fish will be immediately recognizable by its brilliant silver body with large irregular scales and undershot jaw. Another outstanding feature is the prolonged dorsal ray, a stout filament which extends just above the back. Ichthyologists Ray and Ciampi have written that in its leaps from the water, the filament is used to determine the direction of the fall. The leaps are legendary, which is why the tarpon, although of no particular food value, is considered one of the world's gamest fish. 🐟

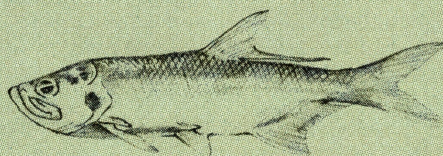
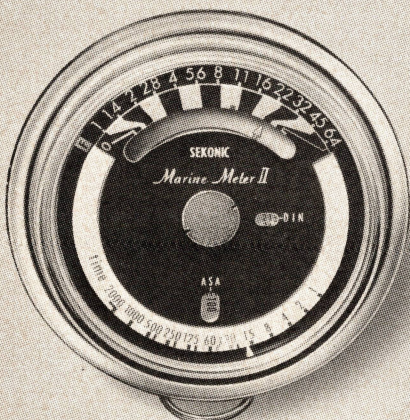


Photo By Paul Humann - Text By Hillary Hauser

The photo was taken in 25 feet of water on Tarpon Alley, off Grand Cayman Island, British West Indies. Humann used a Nikonos II camera with a Secor 21mm lens, Subsea Mark 150 strobe. Kodachrome film shot at f8 1/60 sec.

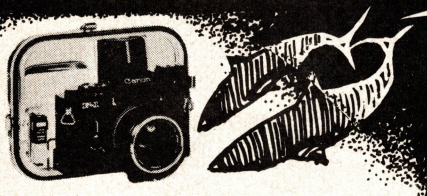
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Seasickness

(continued from Page 15)

ness include: cyclizine (Marezine), 50 mg taken one to two hours beforehand; meclizine (Bonine, Antivest, Ancolan, Postafene), 25 to 50 mg taken one to two hours beforehand; dimenhydrinate (Dramamine), 50 to 100 mg taken 30 minutes beforehand. For prolonged trips, it may be helpful to use either meclizine or cyclizine every four to six hours daily in 50 mg doses.

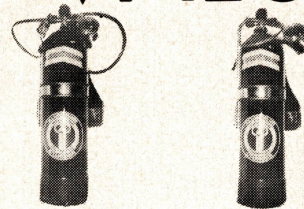
Once the syndrome is underway, drugs may be beneficial as required only if vomiting has occurred. Fluid replacement may hasten recovery. Regardless of whether the drug is prescription or non-prescription, anyone taking these or similar medications is urged to obtain a physician's approval. Side effects may be dangerous, especially if a person is simultaneously taking medication for other physical or emotional problems.

FURTHER PRECAUTIONS — Sensing an attack, there are several precautionary measures that should be followed. Find a place to lie down flat on your back with only a thin pillow under the head. Keep the head firmly on a head rest or push the head back against something. Lie in the middle of the deck or in a place where fresh air and the least amount of turbulence is possible. If possible, gaze at a fixed point such as the horizon. It may be best to close the eyes if the only visual point is moving relative to the person, differently from inertial space. Think about things other than motion, such as mental arithmetic. Keep warm and quiet.

If underwater when the syndrome strikes, if feasible come to the surface and lie quietly on the back. If you cannot surface safely, try to hold on to an immovable object and keep the head still. Remember that a characteristic common to all of the various head movements causing seasickness is varying speed. To be effective in causing seasickness, the acceleration of a person or the head must be changing with time. Seasickness does not usually result with acceleration that does not change relative.

The nature of seasickness remains in many ways a mystery. Some people adapt well after several exposures to this syndrome and seldom get sick. Others never become accustomed to the abnormal movements. It is a complex sickness that is quite disturbing to many people in or on the sea. Since the mechanism of action is not fully understood, the selection of preventive measures continues largely to be based on theory. Hopefully research will someday come up with a sure cure. Until that time, people will continue to dive, seasickness or not. The best advice is to keep up with the latest scientific information in order to select the best preventive measures or treatment for your specific needs.

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TREASURE!

One Man's Successful Search For Millions

By National Geographic Society

painting by Yeorgos N. Lampathakis

Hurricane winds struck the Florida Keys September 6, 1622, sinking the treasure laden Spanish galleon *Atocha*. Now, three and a half centuries later, an ex-dive shop owner is bringing her millions of dollars in treasure to the surface, piece by precious piece.

The story of Mel Fisher's quest for the *Atocha* and her lucrative cargo — now worth perhaps \$100 million — is the subject of *TREASURE!* a new National Geographic special on public television, Tuesday, December 7, at 8 p.m./7 p.m. Central on PBS. (Check local listings.)

The hour long documentary, hosted by E. G. Marshall and narrated by Alexander Scourby, is co-produced by the National Geographic Society and WQED/Pittsburgh, a PBS production center. The specials are made possible by a grant from Gulf Oil Corporation.

When Mel Fisher's interest turned from dive shops to treasure, he became one of the world's foremost treasure hunters. To be a great treasure hunter you also have to be a great optimist — Fisher's search for the *Atocha* has taken six tedious years.

Obsessed by the lure of treasure, Fisher in 1963 staked all he owned on a find. In California, he sold everything and brought his family and crew east to Florida. There he joined a treasure salvage company, and he and his partners agreed to work without pay for a year — or until they found treasure. With rare good fortune, they did indeed make an extraordinary find within the year. "Once you see the ocean bottom carpeted with gold coins, you'll never forget it," Mel says of the experience. The salvors had struck a pocket of gold from Spanish ships wrecked in 1715.

When these shipwrecks began yielding less and less, Fisher turned his attention to the *Atocha*, known to have been

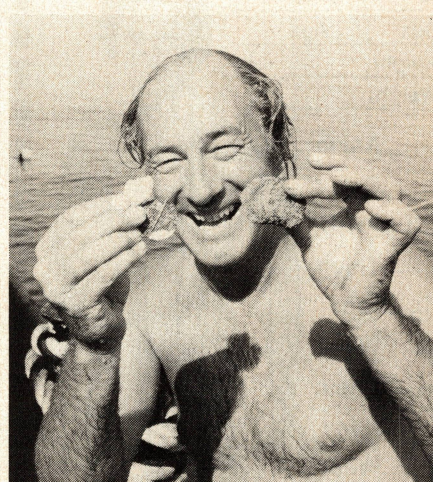
carrying cargo of immense value. The *Atocha's* manifest, still on record in the archives of Seville, lists her passengers, and the wealth in her hold: some 255,000 silver coins, 161 gold bars or disks, 901 bars of silver, 15 tons of Cuban copper, 300 bales of indigo dyestuff from Honduras, 60 muskets, 20 bronze cannons, personal effects of the wealthy passengers, 260 passengers, crew, servants, and slaves. Armed with this information gathered in Spanish archives, he moved from Fort Pierce, Florida, to the Florida Keys. After fruitless searching, Fisher received new information from the Spanish archives, and moved his salvage vessels again to an area called the Quicksands, ten miles west of the Marquesas Keys.

Here, his years of tedious search were rewarded. Divers brought to the surface a musket ball, an anchor, three lengths of gold chain, even a flood of silver coins. But although they were interesting, none of these proved Fisher had found *Atocha*. Then, on July 4, 1973, Fisher's teen-age son and another diver came upon a startling find — a silver bar (looking much like a loaf of bread) and bearing the serial number 4584, weight a little more than 63½ pounds.

A scale preset to 63.6 pounds awaited the salvage vessel *Southwind* as she docked, carrying the precious bar. The crew crowded around as the bar was set upon the scale; the arm wavered, and then settled squarely in the middle. They had found the *Atocha*. Other finds followed: more gold and silver pieces, personal belongings of *Atocha's* wealthy passengers, and bars of silver and gold. Mel Fisher's son Dirk discovered five of *Atocha's* 20 solid bronze cannons.

For Mel Fisher, it seemed the tide had finally turned.

After the *Atocha* and a sister ship sank in 1622, they took the lives of some of



photograph by Don Kincaid © NGS

Mel Fisher displays 17th century gold coins, part of the *Atocha's* treasure.

those who sought them. In the years immediately following their sinkings, the Spaniards sent out salvage expeditions which cost vast sums of money and the lives of many men. Now, *Atocha's* wreck site is found, but not without more tragedy. A few days after the cannons were raised from the ocean, Dirk Fisher, his wife Angel and a small crew once again took the salvage ship *Northwind* out to the wreck site. Suddenly, quietly in the night, the *Northwind* began to take on water, listed and capsized. Dirk, Angel and crewman Rick Gage were trapped below deck and drowned.

Despite disappointment and tragedy, Mel Fisher, like a modern day Ahab, is still obsessed by treasure. There's no longer doubt about *Atocha's* identity, but the whereabouts of yet undiscovered millions in treasure keep both the mystery and the search alive. ➤

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High Altitude Diving

BY STAN E. MCNUTT

Sea level no decompression diving for basic students is taught very well by a great number of underwater instructors, but to stop there is to leave your student ignorant of possible danger when he goes inland.

Never having seen or read any publication on the subject of simplifying and teaching high altitude, no decompression diving, I would like to share my technique with others.

Actually, most inland freshwater dives involve moderate to medium altitudes. But even a properly planned dive to 70 feet at 5000 feet elevation cuts 20 minutes from the sea level no decompression table although the air supply still lasts about the same.

My rule of thumb formula to determine altitude depth is as follows: Add 4 percent (of the actual depth) to the actual depth for each 1000 feet of altitude. The rule applies to simple tank dives at sport depths at less than 8000 feet altitude.

If no altitude tables are available, round off odd altitudes to the next highest 1000 feet and follow standard procedure for entering the standard no decompression table, with uneven depths going to the next deepest listed.

After becoming thoroughly familiar with the factors involved, the student "super simplifies" by remembering: Add 4 percent for each 1000 feet.

For example: A diver wishes to dive to 50 feet at a 5000 altitude; $4\frac{1}{2} \times 5$ (5000 feet) = $20\frac{1}{2}$ correction factor; $20\frac{1}{2} \times 50 = 10$, making the altitude or theoretical depth 60 feet and a maximum bottom time of 60 minutes for no decompression, compared to 100 at sea level.

A more severe example is a dive to 100 feet at 8000 feet altitude. $4\frac{1}{2} \times 8$ (8000 feet) = $32\frac{1}{2}$ correction factor; $32\frac{1}{2} \times 100$ feet = 32 feet or a total of 132 feet. Enter the standard no decompression table at the next highest listed — 140 feet. The maximum bottom time is ten minutes, compared to 25 minutes at sea level. This diver is in danger of up to a 15 minute overstay if he is using sea level tables.

There must be serious consideration of additional safety margins because most medium and high altitude diving involves cold water, sometimes remote locations and often long hikes breathing a somewhat reduced atmosphere. Accurate determination of true depth is also critical to the altitude adjustment. Depth gauges may or may not be working in the diver's favor, especially at altitude. Divers should hold their depth altitude ratio in moderation and always in their favor. And, always remember to consult the tables for repetitive dives. "Don't push the tables" is important in altitude diving.

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MINUTES FROM MANHATTAN
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I suggest the following experiment for all fellow dive instructors. After getting acquainted with the high altitude theoretical depth table imagine a student who is ignorant of altitude considerations, going inland to some dive altitudes of 3000 to 6000 feet. Compute a few hypothetical dives and follow them through all the appropriate tables. You might be surprised to discover that your "hypothetical student," especially one with a low air consumption rate or doing repetitive dives could become a bends case. An even worse possibility is that without any knowledge of this hazard, some other diver error or equipment malfunction may compound his problem into a very serious accident. It's something to think about.

The "rule of thumb" altitude correction factor is very easy for a diver to remember in actual open water diving since all dives are to a planned location where the altitude and correction factor can be included and memorized in the dive plan before leaving home.

The rule and its limitations could easily be incorporated into a printing of the standard no decompression tables and distributed to instructors. I think our students would be even better prepared for safety through education. >

Central California U/W Film Competition

Central California Council of Diving Clubs, Inc. will present an Underwater Film Competition on Saturday, December 4th. The showing will take place at Chabot College Auditorium, 25555 Hesperian Blvd., Hayward, California. Tickets are \$3.00 and are available by writing: CEN-CAL, % Wally West, P.O. Box 882, Livermore, Ca. 94550. >

Sinus Disease Brochure

Divers who suffer from sinus disease will be interested in a brochure written by M. Franc, an ear, nose and throat physician who is aware of the scuba diver's special problems.

Dr. Franc believes in a treatment which uses a minimum of drugs. His favorite prescription is large amounts of hot tea with lemon and honey. He says that many patients find that this really improves their sinus condition.

The name of the brochure is *How To Be Free of Sinus Disease Forever* and it explains what and where the sinuses are, how and why they can become diseased and how they can be treated.

A copy of the brochure can be obtained by sending 50¢ to Hydro Med, Inc., P.O. Box 91273, Worldway Postal Center, Los Angeles, Calif. 90009. >

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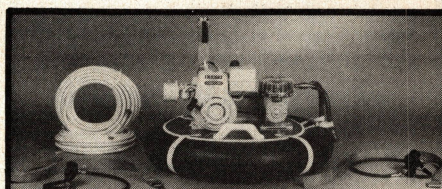
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DESIGN FOR DIVING

By John Hardebeck

In his 1933 hit play, "Design for Living," Noel Coward dramatized an unusual lifestyle. In 1974, Underwater Designers Company, a Jacksonville, Florida firm, dramatically opened a pathway to an exciting, current day lifestyle and a profession as well. Anyone who is reasonably intelligent and healthy and who is willing to invest just ten weeks and a relatively modest amount of money can have both. How? Read on.



The site: Underwater Designers' Florida P.A.D.I. (Professional Association of Diving Instructors) College. There, on campus study leads to full accreditation as a certified P.A.D.I. instructor, equipment repair specialist, underwater photographer, American Heart Association CPR (cardiopulmonary resuscitation) instructor, and Red Cross First Aid and Senior Lifesaving graduate.

The span of employment opportunities which the Florida P.A.D.I. College presents is impressive and diverse. Full-time dive instruction is the most obvious, but not to be overlooked is dive shop management and sales. About 30% of the alumni end up as owners of their own dive shop or related business. Included in the College's overall 80% in field placement rate (an honest, documented figure, according to the College's acting director, John Slate) are graduates working on research vessels; at traditional secondary schools, colleges, and universities; in publishing; with fire-and-rescue units; and at resorts. Living testimonials to the effectiveness of the Florida P.A.D.I. College program are spread over the globe in interesting and exotic spots such as the Florida Keys, the Virgin Islands, St. Vincent in the Caribbean Windward Isles, Canada, Mexico, and Saudi Arabia. The College's placement service is part of the deal, and tailored career counseling is given to each student, pointing him or her in the direction he or she wants to head.

The Florida P.A.D.I. College catalog

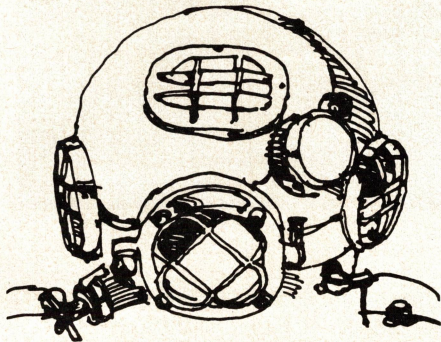
reads like one for a multi-year, traditional institution. There's a specified curriculum of named and numbered courses which are well described and for which the number of required clock hours is given (e.g., #102 — The Theory and Practice Of Underwater Photography — 27 clock hours; #103 — The Description, Operation, And Repair of Dive Equipment — 50 clock hours). Along with classroom courses and in-water

training, practical retail experience is given in the Work Internship course. Students actually serve at least 35 hours on the staff of the two Underwater Designers dive shop facilities. They make sales and repairs, test and fill tanks, and assist graduate instructors in handling basic dive classes. In another course, Business Aspects of Sport Diving, there are seminars given by dive shop operators to prepare the student for dive shop management.

To be eligible, a candidate must be at least 18 years old, have a high school diploma or its equivalent, and have a nationally recognized basic scuba C card, as well as pass a physical examination. Living arrangements are on campus. The comfortable housing units have appropriate facilities, including those for cooking. Total tuition for the ten week course is \$2,000 and embraces all necessities except food, clothing, and books. These days, there are many graduates of "regular" colleges who have paid a lot more than this in time and money and yet can't find a job in their chosen field or even one with a reasonable career track. The Florida P.A.D.I. College seems to me to be a viable option for such people and for those who don't plan on long term higher education.

This unique, multi-faceted dive education is only one in a long line of innovations spawned over the years by Paul and Joe Califano, operators of Underwater Designers Company. They introduced one of the first patented, safe pow-

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erheads. Another striking example of Califano originality is the Scuba Bus service that Underwater Designers inaugurated even before the gasoline shortage of a few years ago. The distinctive yellow, school type buses carry divers to fabulous north and central Florida dive locations. My son and I have ridden these buses to some of the best freshwater diving around. Considering the cost, convenience, and inevitable camaraderie, it certainly beats driving a car that far.

This overriding concern for the clientele was demonstrated again more recently with the establishment of the Florida P.A.D.I. College Leisure Clinic, a flexible arrangement enabling basic course students to gain certification through individual instruction in two-hour segments (fee — \$5 per hour). The timing of all classes is chosen by the student, from daytime and evening sessions running Tuesday and Monday, respectively, through Saturday, to fit his or her circumstances. Open water dives (there's heavy concentration on this approach) are scheduled for Sundays.

The ten week resident diving instructor-equipment repair specialist-management course at Florida P.A.D.I. College is, to my admittedly unprofessional eye, the worldwide premier development in diver education. Apparently, hard-nosed authorities see it in a



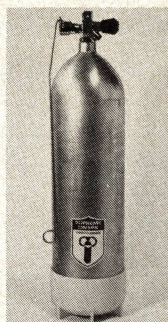
favorable light because the College has been licensed by the Florida State Board of Independent Post Secondary Vocational Technical, Trade, and Business Schools. In a state where private trade and vocational school scandals have been frequent and where state regulators have become hypersensitive, such licensing is no small accomplishment.

The other day, on a brief vacation away from my white collar prison, I dove down through the crystalline waters of one of my favorite springs, pondering the College and wondering why I was born so soon. Oh, well, at least you young whippersnappers out there know about it now. So go to your piggy bank, rip off a dollar, and send it to Florida P.A.D.I. College, 4593 St. Johns Avenue, Jacksonville, Florida 32210. You'll get the College catalog by return mail and maybe a tomorrow that I can only dream about.

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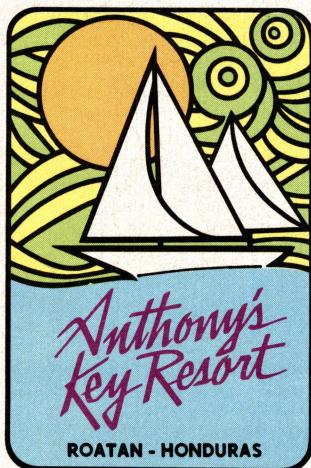
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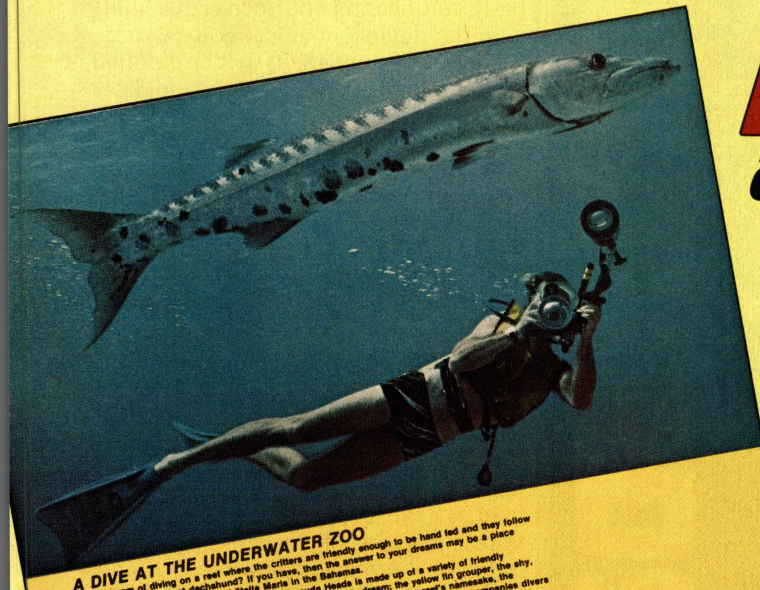
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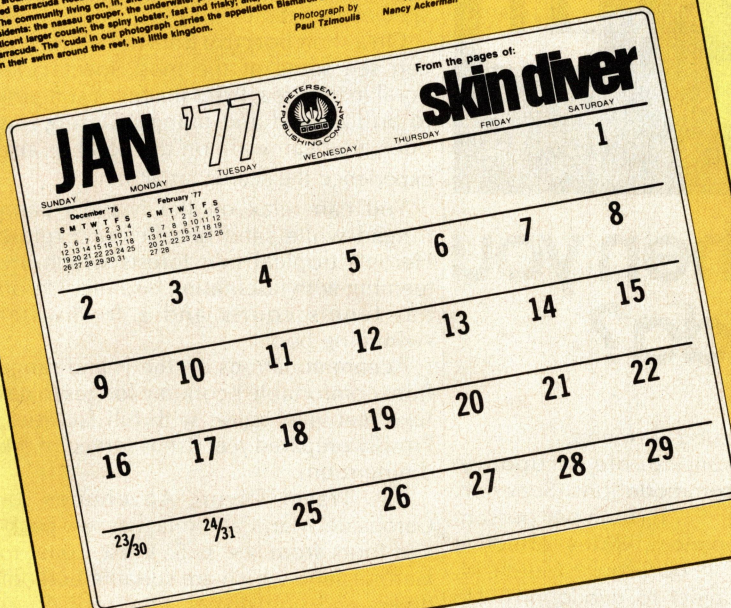
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Photograph by
Paul Tzismoulis
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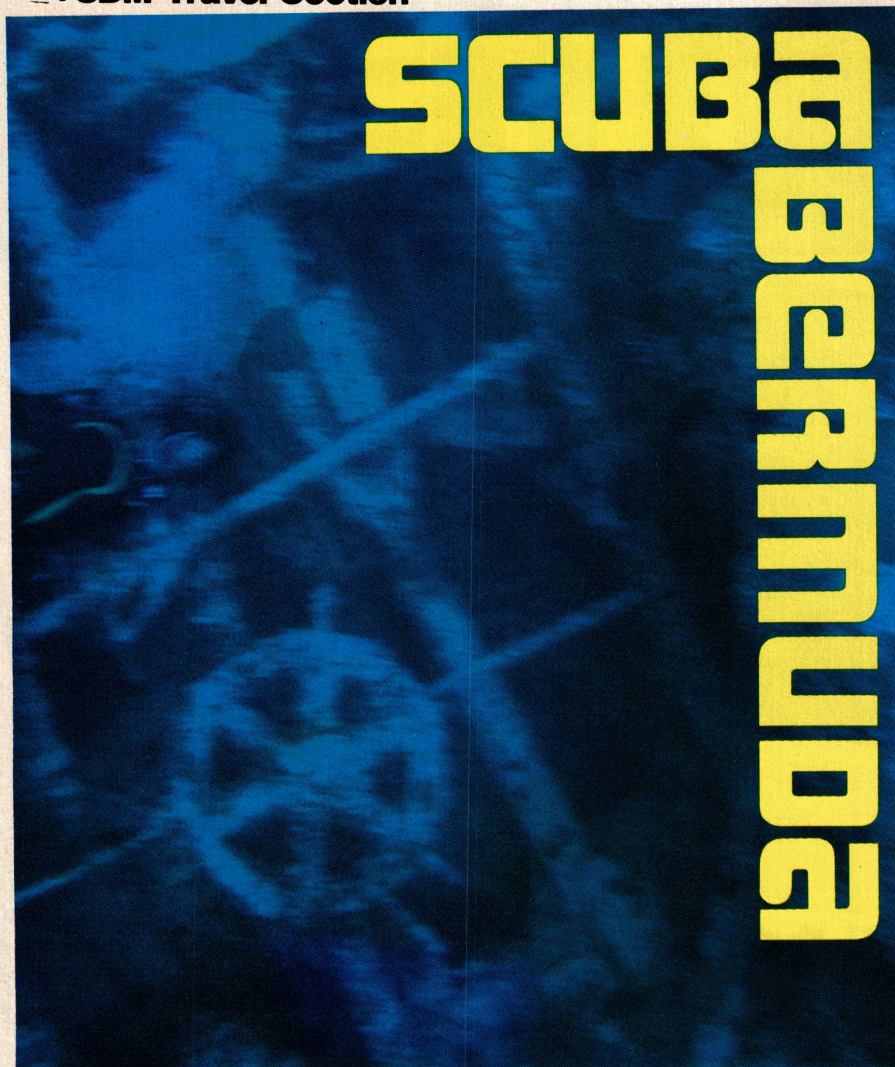
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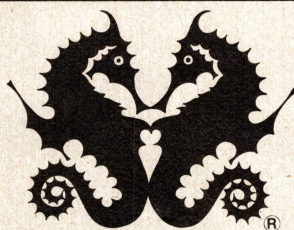
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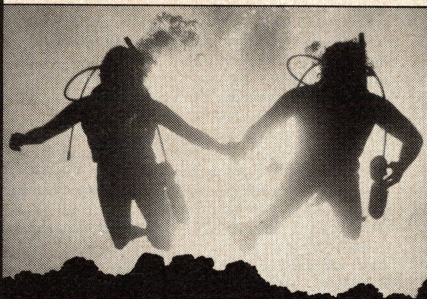
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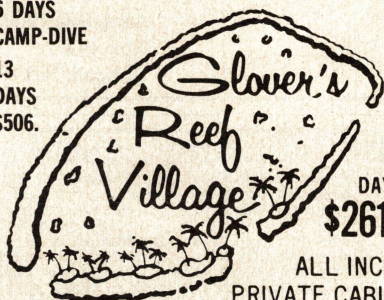
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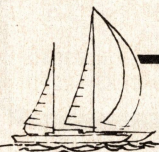
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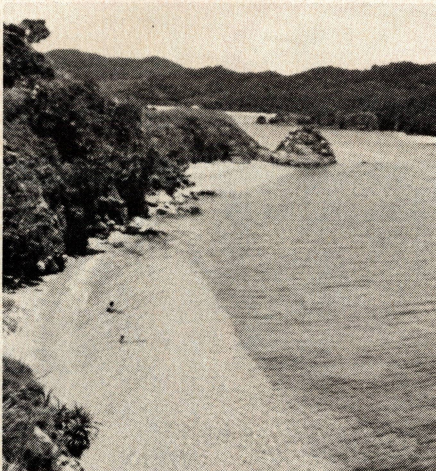
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Expedition Philippines

The Philippines, composed of over 7000 islands, offers the underwater enthusiast countless opportunities to experience a complex and enlightening tropical marine life. Recently, SeaSports has undertaken the exploration of sev-



eral areas in the waters of North Palawan and Western Mindoro, two land masses southwest of Luzon, the Philippines' largest island. The expedition concentrates on the outlying areas which are considered relatively unexplored.

The Expedition leaves for North Palawan aboard a 92-foot boat from the

town of San Jose on the southwest of Mindoro island. This friendly center is serviced daily by a jet flight from Manila. Sections of the vast Busuanga Island Group are explored.

The coral structure and marine life in several of these areas is excellent, with an unbelievable assortment of specimens unique to this area alone. Fish never photographed, illustrated or even named exist in these waters.

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For more information about diving the pristine waters of the Philippines, contact SeaSports and Michael Jones, 1995 Roberts St., Pasay City, Luzon. ☎

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Marsha-Jo Lomont, owner of Glover's Reef Village, Belize, and John and Kellie Lidington, professional underwater photographers of Homestead, Florida, are presenting eight marine science and eight photography courses for 1977.

Utilizing the resort's facilities, students will spend one week diving at Glover's Reef, an atoll 36 miles off the mainland, then proceed the second week aboard the 65-foot *Laughing Bird*

to Lighthouse Reef Atoll and Blue Hole.

Nine hundred dollars covers all expenses for groups of five to eight with one professor. The content of the course will vary according to the interest of the students and professor. Outstanding professors committed to the program are, to date: Dr. Harold Humm, marine phycologist, formerly of Duke University now at Florida Southern University in Tampa; Dr. Robert Johnson, curator of fish at the Field Museum in Chicago; Dr. John R. Tripp, biologist, Florida Southern College; Dr. Bill Harrison, geologist, Western Michigan University; and John and Kellie Lidington, professional U/W photographers, Homestead, Florida. Names of other professors will be announced at a later date.

Dates scheduled for the courses are: Feb 5 to 18, April 2 to 15, May 21 to June 3, June 25 to July 8, and Aug 27 to Sept 9. A \$600 two week semi-camping course will be given April 2 to 15, July 16 to 29, and Dec 24 to Jan 6. All diving for this trip will be at Glover's Atoll except for an overnight trip to the Blue Hole. This trip will be made with 16 to 24 students and two to three professors. Optional college credit is available, as well as PADI photographic course certification.

For further details, write airmail to: Lomont Enterprises, Box 563, Belize City, Belize, Central America; or to John and Kellie Lidington, 14841 SW 298th Terrace, Homestead, Florida 33030. Phone (305) 245-1085. ☎



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Photographed at Kaloa Beach by Slim Aarons

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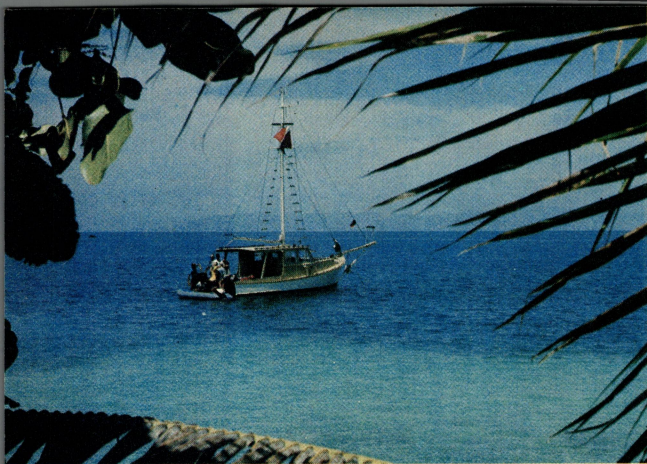


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HAITI'S Kaloa

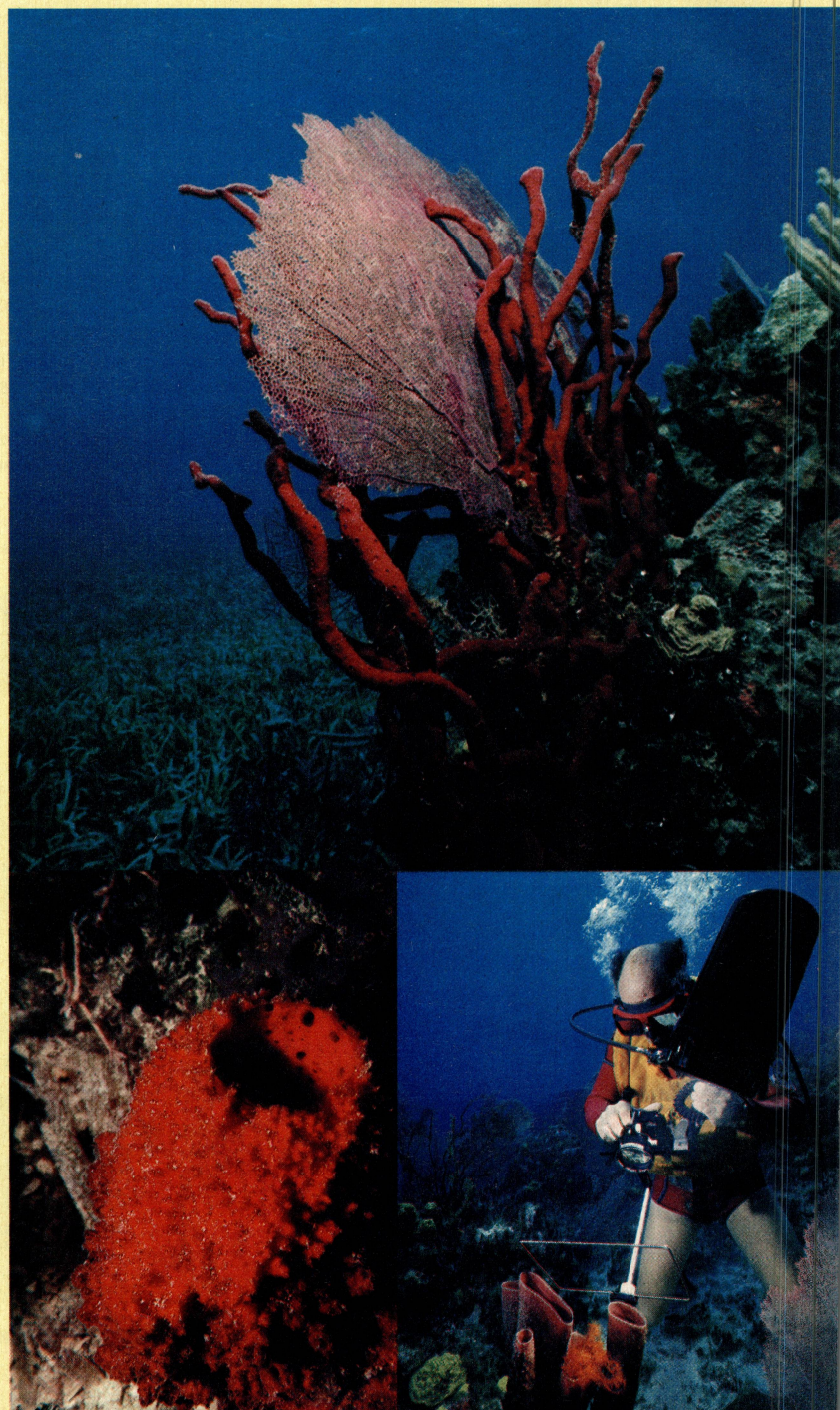
New Scuba

By Paul J. Tzimoulis

Shrouded in mystery and magic, Haiti has remained apart from the twentieth century bustle of Caribbean tourism. While neighboring islands have become overcrowded with high rise hotel and real estate tracts, this fascinating island republic has managed to keep its natural beauty and quaint culture intact. Perhaps primitive by American standards, Haiti stands today as one of the few places in the Caribbean where a visitor can sample the West Indies lifestyle, as it was lived a hundred years ago.

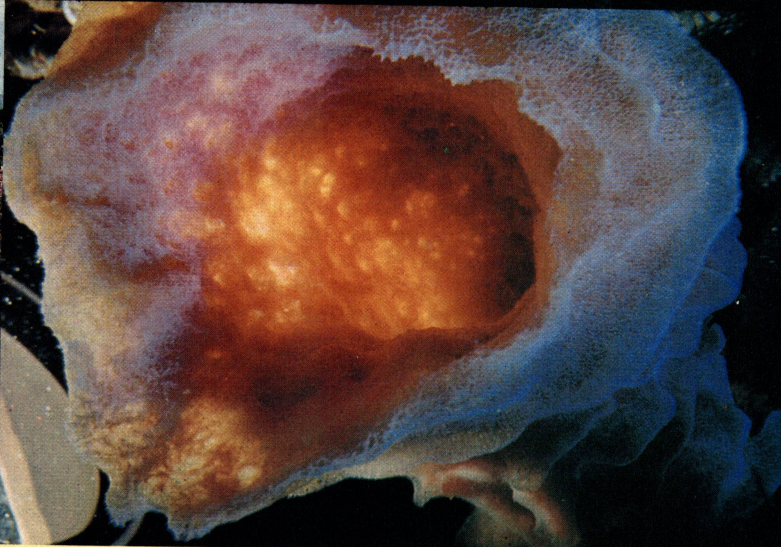
Haiti is a very special place, and totally different from other Caribbean islands. It is blessed with majestic mountains, deep green valleys, and a marvelous tropical climate. Bananas, mangoes, and papayas grow everywhere. Considered poor by our affluent values, the Haitian people are remarkably happy and proud of their heritage. They are wonderfully good natured, with a fine spirit and a great sense of humor. Their culture is a potpourri of African, French, and Caribbean Creole . . . all of which is graphically portrayed in their colorful art, unique religion, delightful cuisine. If one has to make a comparison, the best you can say is that Haiti is a blend of Tahiti and Africa, offering the best of both.

Of particular interest to traveling divers is the fact that Haiti's reefs are virtually virgin territory. Local island fishermen are too poor to afford much more than a cheap face mask and homemade speargun. Their hunting grounds have been limited to only the shallowest of reefs close in to shore. Haiti's upper class of wealthy merchants and businessmen have never taken a fancy to scuba diving, so there has never been a dive club association or an extensive exploration of the reefs. In fact, it has not been until this year that a dive shop or dive boat existed on a permanent basis. Prior visitors have found it almost impossible to rent tanks or obtain air refills, and the few groups that have managed to dive Haiti have had to bring most of their gear with them. The end result is that Haiti's reefs are still uncharted, unexplored, and untouched by divers. Below the surface lies an undersea wilderness filled with beauty and the potential of great adventure.



Beach Resort

Facility Opens The Door To The Caribbean's Most Colorful Islands



photography by Author



Haiti is one of the few countries in the Caribbean which has remained untouched by tourism. Warm, tropical waters make it a diver's paradise. Kaloa Beach Resort is a comparatively new hotel which has just recently opened its doors for scuba visitors. It is the only hotel in Haiti which offers a full service dive shop facility and dive boat which operate on a permanent basis.

Kaloe Beach Resort is a comparatively new hotel for Haiti, having first opened its doors in 1974. It is a cozy resort comprised of some 14 private bungalows nestled together in a cluster, close to the water's edge. The atmosphere is informal and yet distinctively stylish. For example, each bungalow is constructed of native stone and designed in a circular architecture with a high peaked thatched roof. The dining room and cocktail lounge are also constructed of beautiful stone masonry and decorated with some of the finest examples of Haitian primitive art. The hotel grounds are beautifully landscaped with small winding walkways, flowers of every color, and bountiful fruit trees.

Kaloe Beach is a perfect setting for the vacationing scuba diver who wants to be close to the water, and yet enjoy the modern comforts of a hot shower, delicious food, and the warm cordiality of a friendly hotel staff. The open air dining room is an absolute delight since this part of Haiti does not have an insect problem. You can enjoy the aroma of sweet scented flowers and listen to the waves softly lapping against the beach while dining on lobster, steak, or fresh fish prepared Haitian style. In addition to a private beach and dive boat, this lovely hotel offers horseback riding, tennis, and a discotheque for evening entertainment.

It was in August of this year that the Kaloe Beach Resort officially opened its doors for diving tourism. After several

exasperating false starts, the management of Kaloe Beach finally got together with Dave Inman, a highly successful dive shop entrepreneur from Hollywood, Florida. Under Inman's directorship, a full service dive shop was installed on the hotel grounds adjacent to the beach and pier. The name of the new venture is Divers Unlimited of Haiti, with Captain Phil Chaulker serving as resident shop manager and divemaster. The shop contains an inventory of 53 rental tanks, 18 single hose regulators and an assortment of backpacks, weight belts, safety vests and snorkeling equipment.

As for air refills, the new shop is well equipped with a 15 cfm/2500 psi electric motor driven Joy compressor. There is also a 16 cfm/5000 psi electric motor driven Worthington compressor. And should there be an electric power problem, the shop also has on standby an 8 cfm/2500 psi gasoline driven Ingersoll-Rand unit.

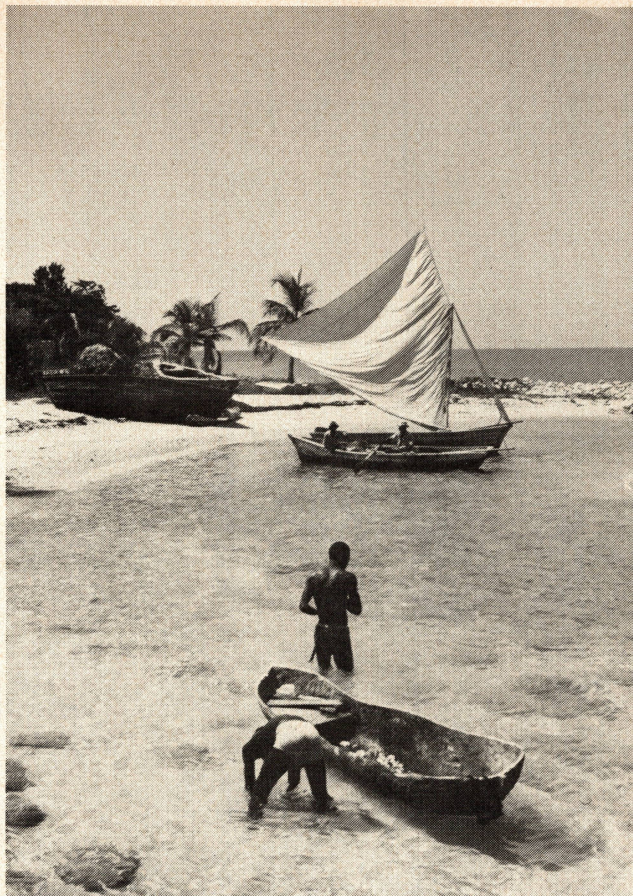
Moored only a few steps from the dive shop door is a 37-foot converted Nova Scotia sword fishing vessel called the Reef Roamer. It has been completely customized for diving, with a wide teak diving ramp attached to the stern, and tank racks for 32 scuba bottles. The hull has been coated with ferro cement to withstand the rigors of coral reef cruising. The boat is powered by a diesel engine and cruises at eight knots with a full load of divers. She is a comfortable, roomy

vessel capable of carrying up to 15 people.

Phil Chaulker, skipper and owner of the *Reef Roamer* utilized this very same vessel for dive cruises in the Bahamas for six and one-half years. Formerly operating under the name of Tropic Diving Cruises, Chaulker spent the majority of his time guiding vacationing divers to the finest spots in the Bimini Islands, Andros, and the Berries. Originally from Detroit, he has been diving for more than 15 years and formerly served as president of the American Skindiving Association. He worked for two years as a commercial salvage diver in the Great Lakes, but found that he could make a happier and more enjoyable living as a professional underwater guide and charter boat skipper. Chaulker is an expert diver with an uncanny knack for finding new diving locations. He spends a good deal of his spare time exploring and charting the reefs, maintaining an accurate log book of the choicest dive spot locations.

In just the short time that Chaulker has been operating dive trips in Haiti, he has already located more than a dozen excellent dive spots ranging from shallow coral gardens to vertical drop-offs with spectacular trees of black coral. Contrary to earlier rumors and misconceptions, Haiti offers some very fine diving opportunities. The sponge life is extraordinarily colorful and prolific, probably due to the warm, nutrient rich currents which feed the coral reefs in the Gonave Bay area. The coral reef ecology is both rich in variety and bountiful in numbers. Most of the shallow reefs are tightly packed with sea fans, stony corals, sea whips, sponges and gorgonians. Although the fish life may not be so plentiful as other places in the Caribbean, there are fish both in numbers and in size.

The dive areas currently being visited by Chaulker can be segregated into four basic areas. The first group is an area with shallow coral gardens close to the hotel. Most of these small reefs lie in 30 feet water and can be reached in five to ten minutes by dive boat. The second area is a number of inshore reefs several miles west of Kaloa Beach which offer some very interesting diving. These spots include Voodoo Heads and Bullwinkle Reef. The reefs usually begin in 30 feet of water and slope steeply to 130 feet or more. The third area is a cluster of small islands and coral reefs five miles south of the hotel. Named the Arcadins, these offshore keys are uninhabited and offer almost virgin reef diving. Diving depths range from 10 to 30 feet. It is approximately an hour and a half sail southwest of the hotel to the eastern edge of Gonave Island, the fourth diving area. It is here that visitors are thrilled by the vertical drop-offs and magnificent coral walls at Bluff Point and Little Bay. These drop-offs



The life style of the Haitian natives has changed very little in the last century. Here the scuba diver can enjoy the old life-style and modern diving. Giant purple sea fans are only one of the marine attractions in the tropical waters of Kaloa Reef.





begin at 20 feet and drop vertically to depths of 130 feet or more. Each of the four areas offer a distinctly different type of coral reef terrain, thus providing Captain Chaulker with a wide variety of undersea attractions.

After touring many of the locations during a week of exploration, I found one of my favorite dive spots to be a small coral garden called Kaloa Reef. Located only 200 yards offshore and less than one-quarter mile from the hotel, I found this reef easy to reach and convenient for a maximum amount of bottom time. Since the reef is located close to shore, it is well protected from the usual afternoon trade winds, thus offering calm and comfortable diving conditions during any hour of the day.

Kaloa is a comparatively small reef with low profile coral heads spread over four acres of sea bottom. Maximum depth is 30 feet with many coral heads rising up to the 20 foot level. Although the reef was small I found it loaded with a marvelous variety of brilliantly colored sponges. The tall, majestically shaped yellow tube sponges were the first to attract my attention, as I could already spot their many locations from the surface. Upon

closer examination, I found the reef to be packed solid with gray cup sponges, brown bluff lobe sponges, blue and purple finger sponges, and azure vase sponges. The variety was quite astounding, and, of course, ideal for my underwater photography efforts. Probably the most fascinating forms on this reef included a rather rare species of custard colored cup sponges and a delicately structured species of bright red finger sponge. Other species ranged in color tone from brilliant orange to strawberry pink and deep purple. The variety of shapes and range of colors equaled anything that I have seen in either Bonaire or Grand Cayman.

Kaloa's sponges are but only one of its many attractions. The marine life on this reef is incredibly prolific considering the size of the reef and depth of water. Great purple sea fans and towering sea plumes adorn the tops of most every coral head, while orange, yellow or green crinoids are tucked away into practically every coral crevice or overhang. It is a miniature fairyland of exotic marine life with hundreds of tiny creatures to discover and observe. Nestled safely under almost every coral outcropping, one finds an arrow crab, a banded coral shrimp, baby

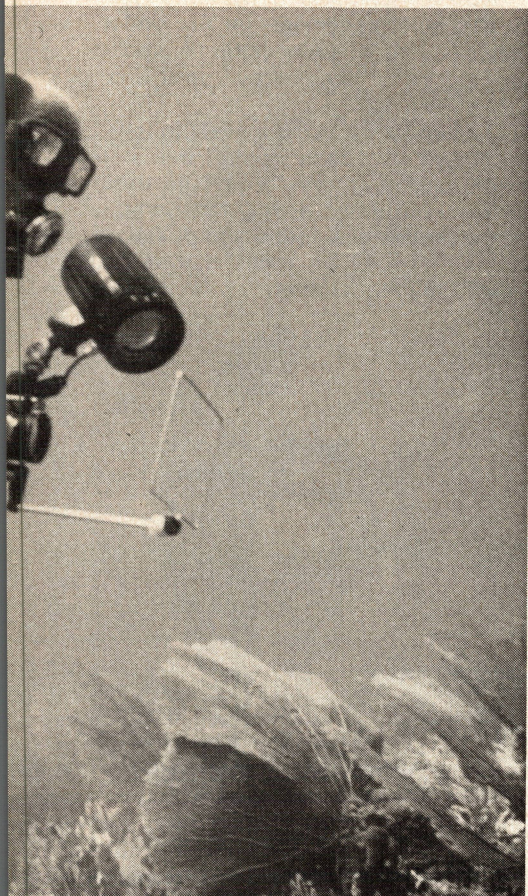
lobster, anemone shrimp or other type of fascinating crustacea.

Among the more exotic creatures observed during my dives was a gold spotted snake eel winding its way through the grass in a sand patch. This particular type of eel is very docile and quite easy to photograph. On another dive I encountered a pair of squid who were not easily frightened away by either my approach or the bright flash of the strobe.

Kaloa reef can be many things to different people. It represents the ideal undersea studio for the photographer who is seeking a maximum amount of bottom time and a wide variety of subject matter. It is also a perfect place for your first scuba dive and equipment shakedown. Kaloa provides a marvelous opportunity for the snorkeler as well since the water is quite shallow and much of the reef can be seen while swimming along the surface.

Of course, there is more to Haiti than just good diving. It is truly one of the most fascinating countries in the Caribbean for both sightseeing and shopping bargains. Prices for Haitian handicraft and art work are less than one-fourth the current prices in the United States.

Oceaneers of Hollywood, Florida, is



both the U.S. booking agent and dive tour operator for the Kaloa Beach Resort. They have put together a very attractive one-week diver's package for the incredibly low price of \$389. The package includes seven nights' stay at the hotel, breakfast and dinner each day, transportation from the airport to the hotel (36 miles) and return, ten dives, an authentic voodoo ceremony at a nearby village and a day of sightseeing at Port-au-Prince. The same package price is in effect throughout the year.

Haiti is comparatively easy to reach as there is daily jet service available from both Miami and New York. Air France operates an afternoon flight from Miami with special low price fares for mid-week travel. Pan Am also has flights from Miami to Port-au-Prince. American airline offers jet service from New York to Port-au-Prince.

For more information and brochures you can write to: Stanley Goldsmith, Director, Oceaneers Dive Tours Inc., 5555 Hollywood Blvd., Hollywood, Fla. Their telephone number for Florida residents is: (305) 983-0017. Oceaneers also has a toll free number for out-of-state divers: 1-800-327-3810. >



Dave Inman, owner and operator of Divers Unlimited of Haiti, leads a group of divers through Kaloa Reef's lush marine growth. American Airlines offers daily jet service to Port-au-Prince from New York. Air France offers daily jet service to Port-au-Prince from Miami. Diving at Kaloa Beach is from Reef Roamer, skippered by Phil Chaulker.



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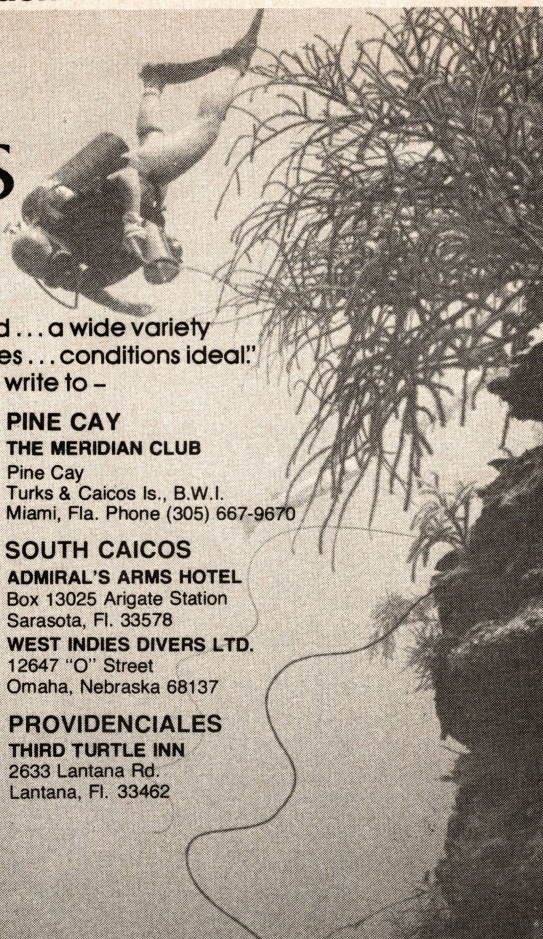
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U/W Adventurers Association

Sam Davison of Dacor has announced that travel arrangements for the Underwater Adventurers Association members are now being handled by Travel Core, Ltd. of Chicago.

Davison said "as the interest in travel increases by scuba divers then it is necessary that the largest national specialist in scuba diving travel who is also a professional tour operator and retailer of travel be commissioned to handle the Association."



Harry Shanks, President of Travel Core, was the marketing consultant who first put together the Adventurers and its travel program for Dacor. The needs and the wants of the scuba diving traveler and association members will be emphasized by Shanks personally. He is prominently known in the midwest and the Chicago area. Nationally, he also speaks and acts for the sport divers as the Administrative Director of the Underwater Society of America and represents them in the National Scuba Advisory Committee.

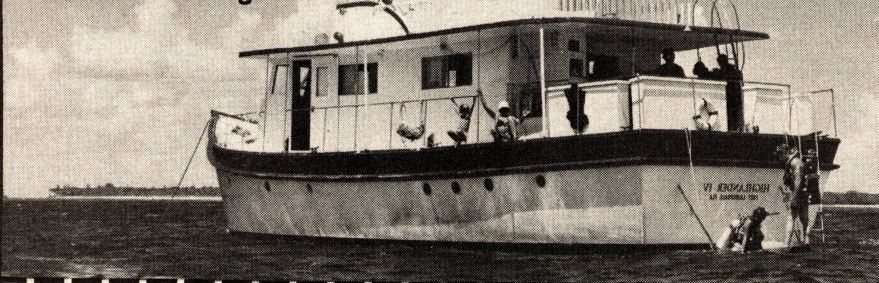
The Underwater Adventurers Association is growing steadily and has expanded in the types of diving trips offered — Bonaire, Jamaica, Grand Cayman, Cozumel, Bahamas, Norwegian Caribbean Lines Fly-Dive-Cruises, Hawaii, Truk and will soon add others from Travel Core's charter O.T.C. programs.

The new scuba travel programs that will be added by Travel Core according to Shanks, "will be both innovative and low cost but directed by the premise that the scuba diver is a tourist first and a diver second due to the fact that he spends more time above the water than below it. All programs will feature a complete package price including meals, accommodations, diving, transfers, tips, equipment and boats where necessary . . ."

Travel expertise is supplied by tour executives with over 50 years of experience at Travel Core and tied to the over 1000 Dacor dealers in the U.S. and Canada with a toll free number, (800)

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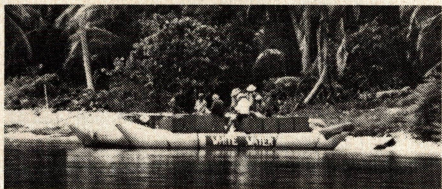


621-0472, for any questions, special planning, new location information and departure dates. This plan ties the customer and the travel experts together. The phone can also be used by divers and instructors for direct information on groups or special programs. Membership in the association is not necessary at the time of contact. All tickets, forms, vouchers, etc. are sent first class air mail seven to ten days before departure.

The Underwater Adventurers Association's new address is 180 N. LaSalle Street, Suite 2920, Chicago, Illinois 60601 or call (800) 621-0472. Membership is \$5, \$3 to members of the Underwater Society of America. >

Caribbean Expedition

Henry and Grace Falany of White Water River Expeditions have provided



wilderness experiences to tens of thousands of outdoor adventure seekers on the wild rivers of the west including the mighty Colorado River through the Grand Canyon. They are now using their large, rugged canyon rigs and outdoor

knowledge to open the beautiful, but primitive water of Lighthouse Reef, in the Caribbean, to interested adventurers.

Lighthouse Reef is the least visited of three atolls. As well as its beautiful isolated islands, it offers exotic coral gardens and some of the clearest waters in the world. Located in the center of the atoll is the famous Blue Hole, a spectacular deep circular coral formation.

Some of the world's best deep sea fishing, snorkeling and scuba diving are within minutes of the camp. Tackle and dive equipment (including air compressor) are provided. Also available are two glass bottom boats.

A one and a half hour direct flight from New Orleans or Miami puts the traveler in Belize City. Land price for seven days is \$395 per person. This includes a half day guided tour to Altun-Ha Maya Ruins and all guides, meals, boats and equipment on the island tour.

Expeditions run January through April. For a free color brochure contact White River Expeditions, P.O. Box 1249 S.D., Turlock, Calif. 95380. >

Batchelder VP Columbus Landings

Richard Batchelder of Flint, Michigan, has been appointed Vice President — Resort Activities of Columbus Landings on San Salvador in the Bahamas.



Dick has had many years experience in the diving field as past owner of two large full service dive shops. He has been certified as an instructor by NAUI, YMCA, PADI and SSI and has served as training and course director of many instructor courses. He has organized many group trips to various islands and has worked with some resort areas, setting up their entire diving operations. He is a specialist in high pressure air systems.

He will be responsible for coordination and promotion of all diving and related resort activities at the Riding Rock Inn on San Salvador. He will be stationed in Ft. Lauderdale where he will also coordinate relations with the industry. >



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☐ Truk Lagoon ☐ Cozumel ☐ Grand Cayman ☐ Bonaire/Curacao
☐ Dutch Antilles

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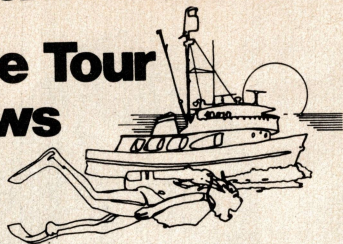
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Dive Tour News



Dec. 3, 10—BONAIRE—8 days, World Wide Divers, Inc., New York, NY
 Dec. 3, 12, 27—BAHAMAS—7 days, Tropic Diving Cruises, Inc., Ft. Lauderdale, FL
 Dec. 3 — BONAIRE — 8 days, Happy Wanderer Travel, Scarsdale, NY
 Dec. 3, 10, 17, 24, 30 — BONAIRE — 8 days, Lisind Int'l, New York, NY
 Dec. 3, 10, 17 — HAITI — 5 or 8 days, Oceaneers Dive Tours Inc., Hollywood, FL
 Dec. 4, 11, 18, 25—MAYA BEACH BELIZE—8 days, Horizons Int'l, Seattle, WA
 Dec. 4 — BELIZE — 7 days, NASDS store/school, Huntsville, AL
 Dec. 4—FREEPORT—8 days, Go Diving, Inc., Minneapolis, MN
 Dec. 8 — FLORIDA CAVES — 5 days, Berry Distributors, Inc., Alsip, IL
 Dec. 11 — AKUMAL — 8 days, Lisind Int'l, New York, NY

Dec. 12—BELIZE—7 days, Go Diving, Inc., Minneapolis, MN
 Dec. 14 — AUSTRALIA — 22 days, Pier 161 Scuba Center, Columbus, OH
 Dec. 18 — CAYMAN ISLANDS — 10 days, See & Sea Travel, San Francisco, CA
 Dec. 18 — COZUMEL — 10 days, See & Sea Travel, San Francisco, CA
 Dec. 19—SAN ANDRES—8 days, Go Diving, Inc., Minneapolis, MN
 Dec. 19—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN
 Dec. 19—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN
 Dec. 19—FREEPORT—8 days, Go Diving, Inc., Minneapolis, MN
 Dec. 19—BELIZE—7 days, Go Diving, Inc., Minneapolis, MN
 Dec. 23 — KONA — 7 days, See & Sea Travel, San Francisco, CA
 Dec. 24 — SAN SALVADOR — 8 days, Horizons Int'l, Seattle, WA
 Dec. 24 — BONAIRE — 8 days, Happy Wanderer Travel, Scarsdale, NY
 Dec. 24 — HAITI — 8 days, Happy Wanderer Travel, Scarsdale, NY
 Dec. 24—HAITI—10 days, Oceaneers, Hollywood, FL
 Dec. 26—SAN ANDRES—8 days, Go Diving, Inc., Minneapolis, MN
 Dec. 26—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN
 Dec. 26—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN
 Dec. 26—FREEPORT—8 days, Go Diving, Inc., Minneapolis, MN
 Dec. 26—BELIZE—7 days, Go Diving, Inc., Minneapolis, MN
 Dec. 27—BIMINI—7 days, Adventure Cruises, Ft. Lauderdale, FL

Dec. 27 — COZUMEL — 8 days, Sunland Int'l Tours, Beverly Hills, CA
 Dec. 30 — KONA — 7 days, See & Sea Travel, San Francisco, CA
 Jan. 1, 8, 15, 22, 29—MAYA BEACH BELIZE—8 days, Horizons Int'l, Seattle, WA
 Jan. 5, 12—BIMINI—5 days, Adventure Cruises, Ft. Lauderdale, FL
 Jan. 7, 14, 21, 28—BONAIRE—8 days, World Wide Divers, Inc., New York NY
 Jan. 8, 22—BELIZE—7 days, White Water River Expeditions, Turlock, CA
 Jan. 15—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
 Jan. 21—BIMINI—7 days, Adventure Cruises, Ft. Lauderdale, FL
 Jan. 22—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
 Jan. 29—GREAT WHITE SHARK EXPEDITION—17 days, See & Sea Travel, San Francisco, CA
 Feb. 4, 11, 18, 25—BONAIRE—8 days, World Wide Divers Inc., New York, NY
 Feb. 5, 19—BELIZE—7 days, White Water River Expeditions, Turlock, CA
 Feb. 5, 12, 19, 26—MAYA BEACH BELIZE—8 days, Horizons Int'l, Seattle, WA
 Feb. 11 — BONAIRE — 8 days, Happy Wanderer Travel, Scarsdale, NY
 Feb. 12, 22—BIMINI—7 days, Adventure Cruises, Ft. Lauderdale, FL
 Feb. 12—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
 Feb. 18 — SAN SALVADOR — 8 days, Happy Wanderer Travel, Scarsdale, NY
 Feb. 19—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
 Feb. 19—BONAIRE—8 days, See & Sea Travel, Inc., San Francisco, CA
 Mar. 4, 11, 18, 25—BONAIRE—8 days, World Wide Divers, Inc., New York, NY

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 Mar. 5, 12, 19, 26—MAYA BEACH BELIZE—8 days, Horizons Int'l, Seattle, WA
 Mar. 9—GALAPAGOS ISLANDS—18 days, Jack McKenney, See & Sea, San Francisco, CA
 Mar. 12—BIMINI—5 days, Adventure Cruises, Ft. Lauderdale, FL
 Mar. 12—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
 Mar. 13—PHILIPPINE ISLANDS—16 days, Carl Roessler, See & Sea Travel, San Francisco, CA
 Mar. 19—SNOWBIRD & BAJA CALIF—14 days, World Wide Divers, Inc., New York, NY
 Mar. 19—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
 Mar. 21—BIMINI—7 days, Adventure Cruises, Ft. Lauderdale, FL
 Apr. 1, 8, 15, 22, 29—BONAIRE—8 days, World Wide Divers, Inc., New York, NY
 Apr. 2—BELIZE—7 days, White Water River Expeditions, Turlock, CA
 Apr. 2, 9, 16, 23, 30—MAYA BEACH BELIZE—8 days, Horizons Int'l, Seattle, WA
 Apr. 2—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
 Apr. 9—BIMINI—5 days, Adventure Cruises, Ft. Lauderdale, FL
 Apr. 9—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
 Apr. 16—BIMINI—7 days, Adventure Cruises, Ft. Lauderdale, FL
 Apr. 16—BONAIRE—8 days, See & Sea Travel, Inc., San Francisco, CA
 Apr. 23—GRAND CAYMAN—8 days, Jack's Dive Center Inc., Plainville, CT
 Apr. 23—SAN SALVADOR, BAHAMAS—8 days, Tri-City Divers, Vernon, CT
 Apr. 30—REMOTE ISLAND, TAHITI—15 days, Peter Capen, See & Sea, San Francisco, CA
 May 4—GALAPAGOS ISLANDS—18 days, Bob Hollis, See & Sea Travel, Inc., San Francisco, CA
 May 6, 13, 20, 27—BONAIRE—8 days, World Wide Divers, Inc., New York, NY
 May 7, 18—BIMINI—7 days, Adventure Cruises, Ft. Lauderdale, FL
 May 14, 28—ANGUILLA/ST. BARTS—12 days, Trimaran Misty Law, St. Thomas, VI
 May 14—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
 May 14—RED SEA, AQABA—15 days, Carl Roessler, See & Sea Travel, Inc., San Francisco, CA
 May 21—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
 May 21—BONAIRE—8 days, See & Sea Travel, Inc., San Francisco, CA
 May 28—BERMUDA—4 days, World Wide Divers, Inc., New York, NY
 June 3, 10, 17, 24—BONAIRE—8 days, World Wide Divers, Inc., New York, NY
 June 4—REMOTE ISLANDS, TAHITI—15 days, See & Sea Travel, Inc., San Francisco, CA
 June 4—TRUK, MICRONESIA—13 days, See & Sea Travel, Inc., San Francisco, CA
 June 6, 21—BIMINI—10 days, Adventure Cruises, Ft. Lauderdale, FL
 June 11—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
 June 18—VIRGIN ISLANDS—12 days, Trimaran Misty Law, St. Thomas, VI
 June 18—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
 July 1, 8, 15, 22, 29—BONAIRE—8 days, World Wide Divers, Inc., New York, NY
 July 2—VIRGIN ISLANDS—12 days, Trimaran Misty Law, St. Thomas, VI
 July 2—SAN SALVADOR, BAHAMAS—8 days, Tri-City Divers, Vernon, CT
 July 2—TRUK, MICRONESIA—13 days, See & Sea Travel, Inc., San Francisco, CA

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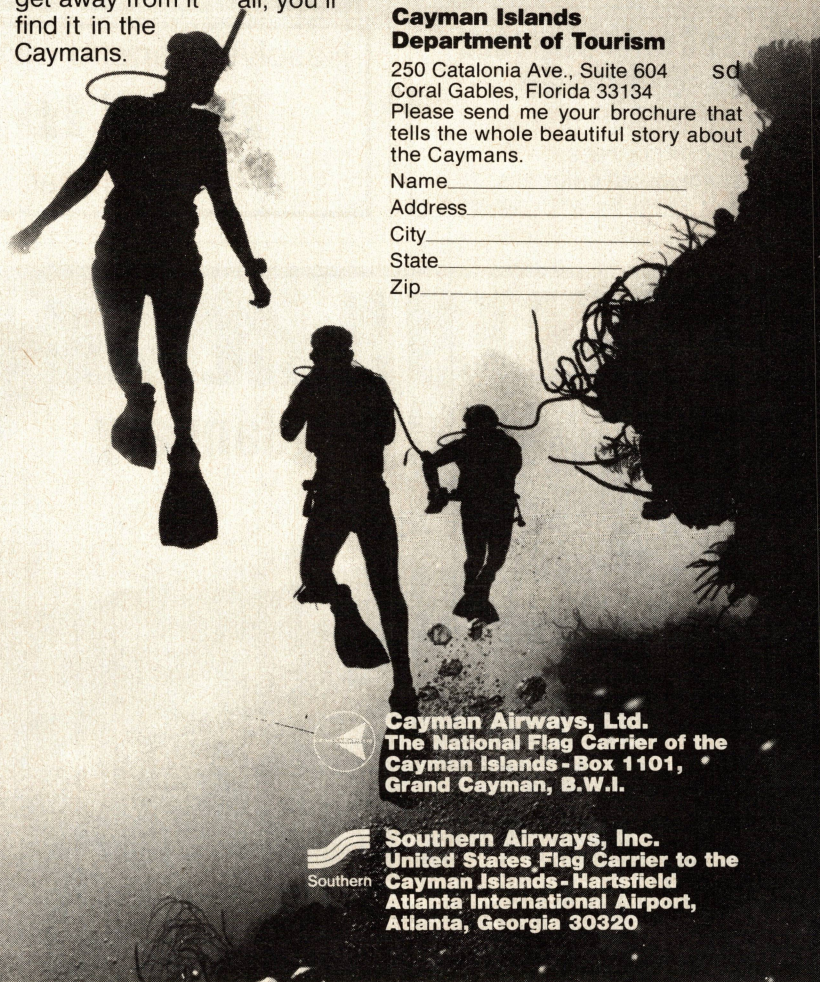
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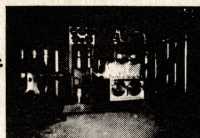
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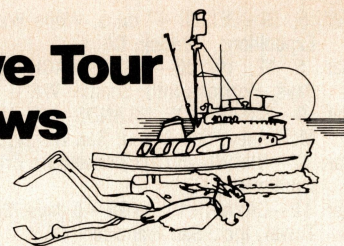
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Dive Tour News



- July 2—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
- July 6—GALAPAGOS ISLANDS—18 days, Paul Humann, See & Sea, San Francisco, CA
- July 9—BONAIRE—8 days, See & Sea Travel, Inc., San Francisco, CA
- July 10—BIMINI/NASSAU—10 days, Adventure Cruises, Ft. Lauderdale, FL
- July 16—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
- July 23—VIRGIN ISLANDS—12 days, Trimaran Misty Law, St. Thomas, VI
- July 24—BIMINI—7 days, Adventure Cruises, Ft. Lauderdale, FL
- Aug. 5—GREAT EXUMA—14 days, Adventure Cruises, Ft. Lauderdale, FL
- Aug. 6—VIRGIN ISLANDS—12 days, Trimaran Misty Law, St. Thomas, VI
- Aug. 6—TRUK, MICRONESIA—13 days, See & Sea Travel, Inc., San Francisco, CA
- Aug. 10—GALAPAGOS ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
- Aug. 13—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
- Aug. 20—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
- Aug. 20—BONAIRE—8 days, See & Sea Travel, Inc., San Francisco, CA
- Aug. 23—GREAT EXUMA/NASSAU—7 days, Adventure Cruises, Ft. Lauderdale, FL
- Aug. 27—VIRGIN ISLANDS—12 days, Trimaran Misty Law, St. Thomas, VI
- Sept. 3—TRUK, MICRONESIA—13 days, See & Sea Travel, Inc., San Francisco, CA
- Sept. 4—NASSAU/BIMINI—10 days, Adventure Cruises, Ft. Lauderdale, FL
- Sept. 10—VIRGIN ISLANDS—12 days, Trimaran Misty Law, St. Thomas, VI
- Sept. 10—CAYMAN/ROATAN CRUISE—12 days, See & Sea Travel, Inc., San Francisco, CA
- Sept. 17—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
- Sept. 17—BONAIRE—8 days, See & Sea Travel, Inc., San Francisco, CA
- Oct. 8—RED SEA/AQABA—15 days, See & Sea Travel, San Francisco, CA
- Oct. 11—AUSTRALIA/CORAL SEA—17 days, See & Sea Travel, San Francisco, CA
- Oct. 15—COZUMEL—8 days, See & Sea Travel, San Francisco, CA
- Oct. 22—CAYMAN ISLANDS—8 days, See & Sea Travel, San Francisco, CA
- Oct. 25—AUSTRALIA/CORAL SEA—17 days, Jack McKenney, See & Sea, San Francisco, CA
- Nov. 19—CAYMAN ISLANDS—8 days, See & Sea Travel, San Francisco, CA
- Nov. 19—COZUMEL—8 days, See & Sea Travel, San Francisco, CA
- Dec. 20—CAYMAN ISLANDS—10 days, Christmas Cruise, See & Sea, San Francisco, CA
- Dec. 20—COZUMEL—10 days, Christmas program, See & Sea, San Francisco, CA

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Hollis to Galapagos With See & Sea

See & Sea Travel announced that its May 4-21 dive cruise in the Galapagos Islands will be escorted by Bob Hollis, president of Oceanic Products, Inc. The Galapagos Islands, 600 miles off the coast of Ecuador, are some of the world's most incredible hothouses of evolutionary development. The islands thrive with endemic species of tortoise, hawk, boobies, cormorant, and both terrestrial and marine iguanas. Fully one-third of all Galapagos species exist nowhere else on earth. The same is true of marine life.

See & Sea programs consist of two full weeks of diving at all the major islands for unusual marine life. Bob Hollis is president of Oceanic Products Inc., and of the Anchor Shack of Hayward, California. Bob has produced films on the lost Windjammer of Bonaire and the *Andrea Doria*, and has been leading See & Sea dive groups for ten years.

For further information on this and other world class dive destinations, contact: See & Sea Travel, Inc., 680 Beach Street, San Francisco, California. ➤

Scubamerica-Haiti

The north coast of the Gulf of Mexico offers some of the best diving in the Caribbean Islands. The main attraction for divers here is the coral encrusted wall which surrounds the 45-mile long LaGonave Island in the middle of the Gulf. Dive boats make the crossing from Kaloa Beach in under an hour. Water temperatures are rarely less than 80° year round with visibility averaging 100 feet. A Japanese freighter sits virtually intact in 100 feet of water. Continental's Scubamerica diving adventure of 8 days/7 nights at \$389 double occupancy, plus air fare includes ground transfers, deluxe hotel accommodations, breakfasts and dinners and 10 dives. Each tour is escorted by a professional dive host.

Complete details on all Scubamerica dive tours may be obtained by writing to Scubamerica Diving Adventures, Box 9000, Van Nuys, Calif. ➤

Kilbride's U/W Tours

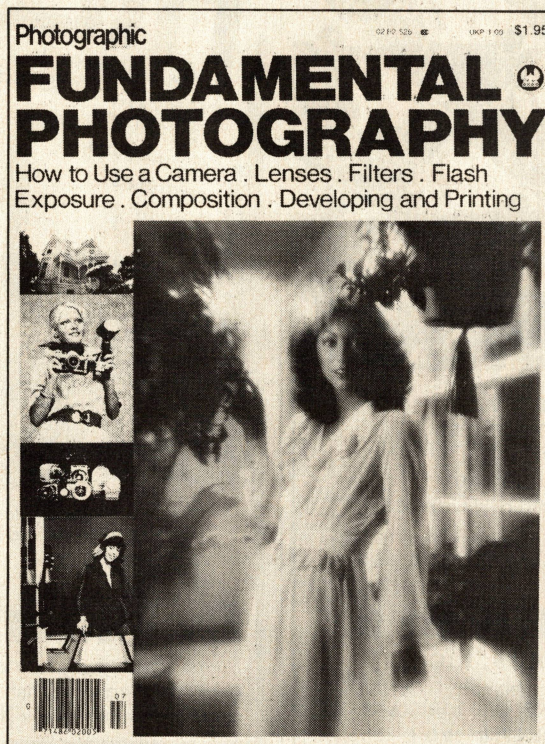
Bert Kilbride is building a new facility in the British Virgin Islands. Planned to accommodate groups of 16 divers, the dormitory type building will have eight double rooms.

Billed as a "do it yourself thing," visitors will provide their own linen and cook their own meals. Kitchen facilities will be available.

A 40 foot boat with an all girl crew of certified instructors will guide divers on two dives on the wrecks of Anegada, two dives on the *Rhone*, and other dives on reefs or sea mounts.

The cost for six nights, ten dives, is \$250. The facilities will be completed by March. Interested groups should write to Bert Kilbride, Box 40, Virgin Gordo, British Virgin Islands. ➤

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Sportsways Distributors

Sportsways, a division of Pittman Rubber Company, Huntington Park, California, has announced that the following foreign companies have been appointed exclusive distributors of the entire line of Sportsways dive equipment.

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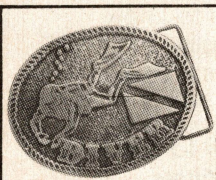
For Switzerland, Germany, France, United Kingdom, Austria, Benelux (Holland) Belgium, Luxembourg, and all Eastern countries: Sportsways International, Inc., "Subaquatic Waterlung" Systems & Equipment, 5, Rue de la Pruley, 1217 Meyrin, Geneva, Switz.

For all of Italy: Longo, P.O. Box AD 1751, Bolonga, Italy.

For all of the Philippines: Bunn's Phils Diving Equipment Corp., 928 Pasay Road, Manila, Philippines.

For all of Australia: Precision Air Equipment Pty. Ltd., 51 Henry Street, Hawthorn, Victoria, Australia 3122.

For all of Malaysia, covering Sabah, Indonesia and Thailand: Aquila Aurea, LG 08 Specialists' Centre Bldg., Orchard Rd/Somerset Rd, Singapore 9.



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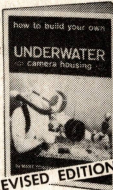
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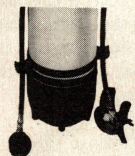


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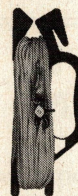
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U.S. Cavaleiro Appoints Ahlgren

U.S. Cavaleiro announces the appointment of Debbie Ahlgren to the position of regional sales manager responsible for the Pacific western states.



Debbie has extensive retail experience, working on the west coast in a managerial position for a chain of dive shops, in charge of sales, advertising and promotion of products and services, as well as displaying and merchandising of equipment. This background gives her a unique advantage of being able to consult with dealers on programs to increase sales, and merchandise of equipment for their market.

Debbie can be contacted at U.S. Cavaleiro, Inc. general offices at 3186 Airway Avenue, Building F, Costa Mesa, California 92626. Telephone: 714-540-9455.

AMF Swimaster Winner

Dave McKnight was the winner in a recent AMF Swimaster dealer contest.



Dave McKnight, right, checks out gear with AMF Voit Sales Promo Mgr. Doug Hester.

The full-time Army captain/part-time scuba shop owner won the trip with best balance of volume and increased sales percentage. He competed with 500 Swimaster dealers nationwide.

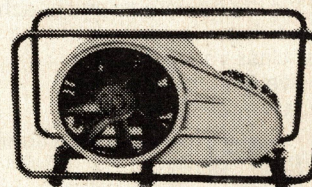
McKnight owns the Night Star Divers Shop in Highland Falls, New York, and will enjoy two weeks of diving in the waters of Truk, Palau and Saipan, compliments of AMF Swimaster.

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DIT Expands

It was just a little over a year ago that the Divers Institute of Technology, Inc. (DIT) announced that they were accepting applications for their new six month Professional Deep Sea Diving Course. Until then, they had offered their students only a 14 week Commercial Deep Sea Diving Course. However, because of the ever expanding growth in the field of professional diving coupled with the fact that manpower needs in the dive industry are constantly changing, DIT believed that they should offer their students a more comprehensive program which would not only equip them with the



necessary skills and talents to meet the new demands confronting the commercial diver of today, but which would also open additional doors to them in the labor market.

John Manlove, newly appointed president of the school, states the new, expanded program has been a total success. At the beginning, very few students elected to continue in the advanced portion of the course, and they accepted their certificates and diplomas after their basic 14 week course was completed. But today it is a different story says Manlove. In the class graduating this month, 80% of the students elected to continue in the advanced program.

Manlove suggests the program has been so popular because the graduate of the advanced program is far more versatile and he has much more to offer his prospective employer. Also, another reason students are enrolling in the six month program, says Manlove, is because additional financial aid is available to them which is not available to the 14 week enrollees. All students are eligible to apply for a 7% loan through the Federally Insured Student Loan Program (FISL), but the six month enrollees are eligible to receive grants (providing they meet eligibility requirements) under the Basic Educational Opportunity Grant Program (BEOG) and the Supplemental Educational Opportunity Grant Program

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(SEOG). In addition, the six month enrollee is eligible to request a 3% loan through the National Direct Student Loan Program. Also, the school is approved for funding of all students through other agencies such as the Comprehensive Employment Training Act Program (CETA), the Vocational Rehabilitation Program (DVR), the Bureau of Indian Affairs (BIA) and programs sponsored by the Veterans Administration.

Because of increased enrollments and larger classes and since students are remaining at school a longer period of time, DIT found it necessary to expand their facilities. They recently completed converting two existing office spaces into additional classroom spaces and they constructed two new office spaces. Some of their newly acquired equipment consists of an underwater television unit for use by their students in the new underwater television and sound devices portion of their course and a new Big 40 welder for use in their advanced underwater welding and cutting classes.

More details about the Divers Institute of Technology, Inc. and the courses they offer may be obtained by writing to the school at 1133 NW 45th Street, PO Box 70312, Seattle, Washington 98107.

Kittredge K-600 Sub

Kittredge Industries, Inc., is manufacturing a one-man submarine which can go to 600 feet. The sub's overall length is 11 feet, five inches. The diameter of the pressure hull is three feet.

The K-600 can travel at seven knots and weighs approximately 3500 pounds. It can stay submerged for one hour, 45 minutes and there is a 72 hour life support system.

The sub operates on eight 12 volt, 102amp/hr batteries. It has two internal depth gauges and its two-way surface to submarine communication system has a theoretical range of ten miles.

The snorkel system consists of an automatic self-closing outboard poppet valve and an inboard quick-closing ball valve. This permits unlimited surface operation without opening the conning tower hatch. The conning tower has five acrylic lens view ports and there is one acrylic lens bottom viewing port.

The sub has three motors, two of which are external and capable of being rotated independently through 360 degrees, thus providing exceptional maneuverability. Maximum thrust can be obtained from an internal three horsepower motor which drives the sub's external, central line propeller.

The sub's optional equipment includes a tandem axle trailer, bottom floodlight and a mechanical claw.

Kittredge has contracted to build ten of the K-600s each year for a Norwegian firm. For more information write: Kittredge Industries, Inc., U.S. Route 1, Warren, Maine 04864.



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January 16-18 – Miami Bch., Fla.

Under the leadership of John Cronin, President of DEMA, the members have retained the services of Jim Hall, Training



John Cronin/President

Facility Director of PADI to coordinate and administrate the new organization as it moves into the mainstream of the sporting goods industry. Hall, who heads the only trade association in the dive industry, will draw upon his extensive background of dealer rapport, familiarity of government agencies and past experience in the retail business to form a dealer/manufacturer interface and solve such chronic problems as liability insur-

DEMA's first efforts will not be public, but will be exclusively for the diving retailers. On January 16, 17, 18 at the Sheraton Four-Ambassadors Hotel in Miami Beach, DEMA will hold the First Annual Diving Industry Trade Show. This show will be open only to dealers and their employees and will feature exhibits and displays from virtually every American equipment manufacturer as they compete to debut their 1977 product lines. Nearly 50 companies, travel agencies and instructional associations will be there to explain their latest products and discuss the dive business. The show, a united effort on behalf of DEMA and non-DEMA manufacturers will conduct workshops, seminars and social activities every day to educate the retailers with sound business advice.

Two programs will highlight the trade show. On Sunday night there will be a cocktail party for the participants and their guests co-hosted by DEMA and SKIN DIVER. Here, in a congenial party mood dive retailers from around the country will have a chance to mingle and talk with industry leaders. The grassroots feedback from this night will be used to plan future DEMA events and to assess the priorities facing the industry.

On Monday, DEMA will hold its first seminar — a continental breakfast and conference in the morning. Planned to address as many important issues as possible, it is hoped that the information disseminated will be of immediate use for the retailers. John Cronin will explain the new organization of DEMA and what it means to the future of the trade, followed by Paul Tzimoulis, Editor/Publisher of SKIN DIVER, who will demonstrate the potential in the latest audiovisual equipment for teaching and dive store

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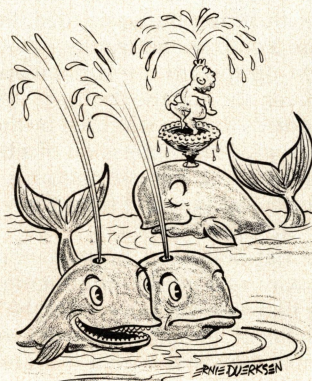
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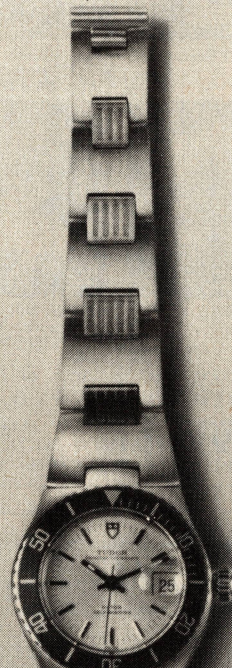


taken an active role in the sport. It is a turning point, the beginning of new growth for the dive industry. In the coming months, you will hear more and more from DEMA as it builds momentum. If you are interested in upcoming programs or wish to pass on important information regarding possible legislation, write: Jim Hall, General Manager, DEMA, 2064 N. Bush Street, Santa Ana, CA 92706; or call (714) 836-1431. 



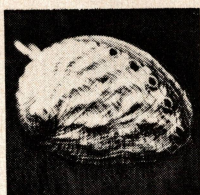
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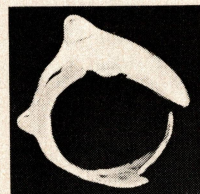




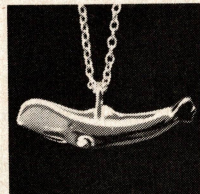
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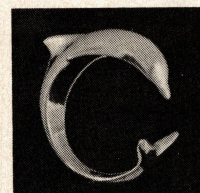
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SEE UNDERWATER WITHOUT A MASK

By Albert L. Pierce

Your mask strap has just broken. Before you can recover it, the mask drops out of reach. The bottom is now a fuzzy jumble of shadows and shapes. Any one of those dark forms could be your mask, but which? You know some of them are the sea urchins you saw before losing your

of your eye's lens action is nullified and everything appears out of focus.

By looking through the air bubble, you will see clearly again. But if the air leaks out past your fingers, the bubble will escape. With practice, you will be able to make a seal tight enough to maintain a bubble for as long as you can hold your breath. Practice in a pool. If you look down while standing in neck deep water, you will be able to see your toes clearly enough to count them. You can make a bubble "mask" with or without scuba. If you are using a regulator, however, you may have to exhale through your nose to get air into the pocket.

Now you can see your mask. But when you reach down to pick it up, the air will leak out and you'll lose your clear vision. Luckily, it is possible to make a bubble "mask" with only one hand. One method is shown in the drawing below. Rotate your hand so it fits the contours of your face tightly, especially on the side away from your nose where the air is most likely to leak out. You may have to exhale a large volume of air all at once to guarantee that some gets past the barrier formed by your thumb and enters the

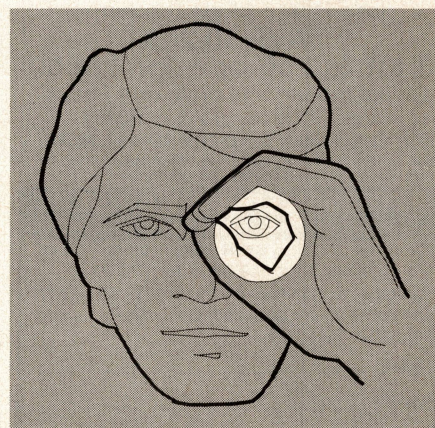


clear vision. To pick up one by mistake would be like grabbing a pincushion studded with long red hot needles!

All is not lost. You don't have to sacrifice your mask and abort the dive. Instead you can make a mask out of a bubble of air and see clearly again. By cupping your hands over your eyes — fingers together, index fingers and thumbs pressed tightly against your head — you can make a pocket which will hold air. Then exhale through your mouth, nose or regulator so that the air rises to fill the pocket. If you wait a few seconds until the ripples stop, you'll see the bottom!

You are looking through a flat plane — the surface of water which is the bottom of the bubble you made. The drawing above illustrates the basic idea. Imagine you are a crab on the sea floor who looks straight up toward the surface and sees the diver facing the bottom. (A little cartoonist's license was used by the illustrator to give the impression of a bubble. It won't have a curved bottom surface, and it obviously won't reflect any "windows" in open water.)

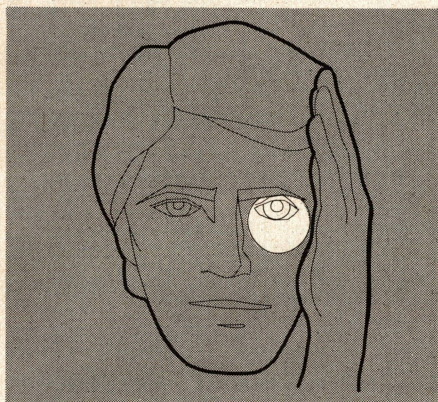
The flat-bottomed bubble works the same way as a mask, introducing an air space between your eyes and the water. The index of refraction of your eye fluids is almost the same as that of water. As a result, when water is all around the semi-spherical cornea of your eye, most



illustrations by Rebecca Salari

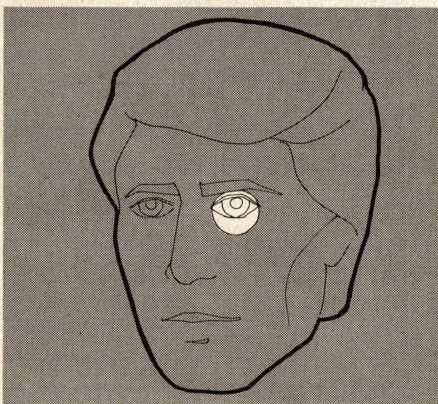
The method shown in the next drawing is quick and simple, but it forms a smaller bubble. It works for most people because the eye socket forms a natural pocket for a bubble trapped by the eyebrow, nose and cheek. The air is blocked from escaping by the palm and the heel of the thumb. By the way, with either of these methods you can use both hands to make two bubbles, one for each eye.

You can even make a bubble "mask" with no hands. First, try the one-hand method shown in the third drawing. Then turn your head toward the side opposite your hand. If you have the angle just right, when you remove your hand you'll be able to keep a small bubble in your eye socket. Because the bubble is tiny, you must look in the same direction



you tilted your head in order to see clearly. Sometimes swimmers accidentally pick up such bubbles, seeing a hand or arm clearly for an instant before it becomes blurred again. Usually these bubbles break right away due to the water turbulence. But if you swim slowly and don't change the angle of your head, you can keep the bubble in place and see clearly for a relatively long time — with both hands free! See fourth illustration.

If you curl your fingers over your forehead, you can make a large bubble with more air space around your eye. This enables you to look at an angle forward as well as straight down, widening your field of vision and increasing the



efficiency of your search. You may find that you need to tilt your head sideways, forward or back a little to capture the largest possible bubble and see in front of you. A little experimentation will perfect this. Of course, you could use both hands to get a larger bubble and a wider angle of forward vision, but then the air will probably escape when you reach down. So the one hand method is best.

When looking forward at an angle, any object you see will not be in line with

(Continued on Page 96)

Jerry Greenberg's SEA POSTERS

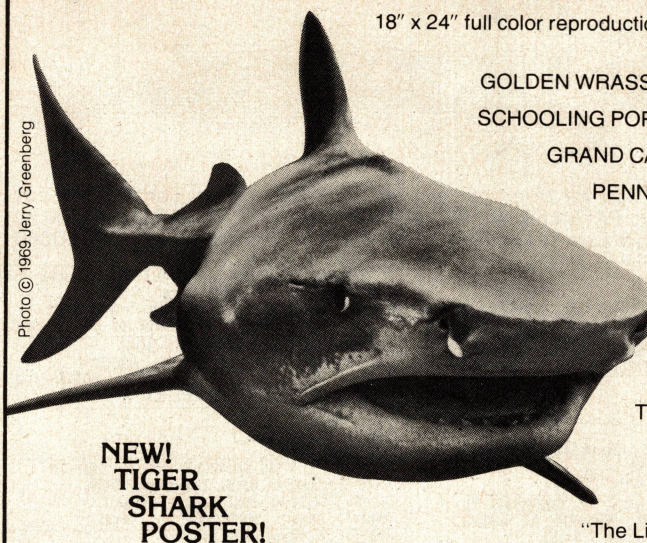


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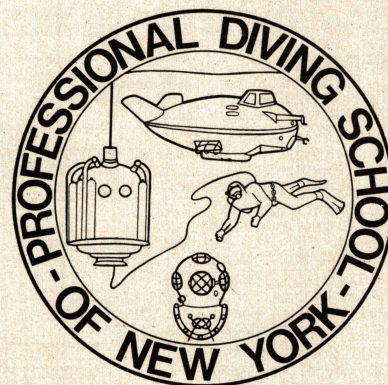
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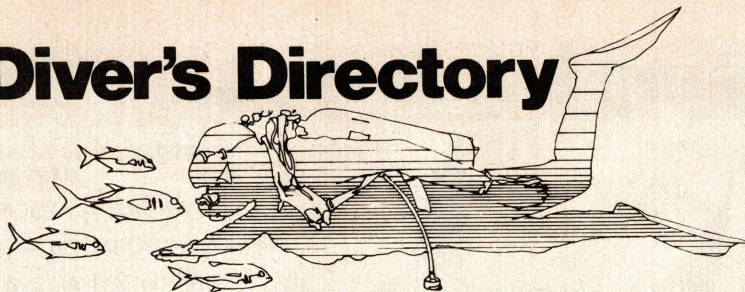
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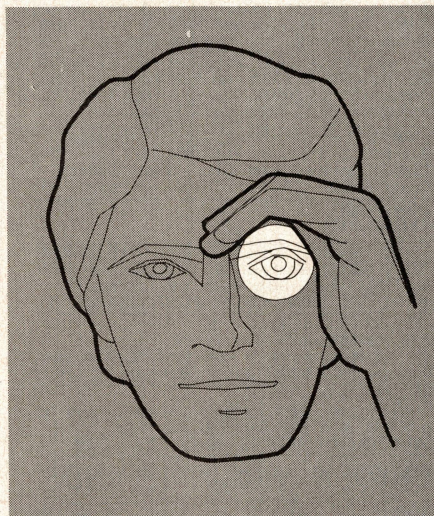
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See Underwater

(Continued from Page 91)

your eye — remember how a straight stick looks bent at the surface of the water? If you grab for something quickly you'll probably miss because it is displaced from your line of sight. However, if you use the one hand or the no hand method and reach slowly, you'll see your



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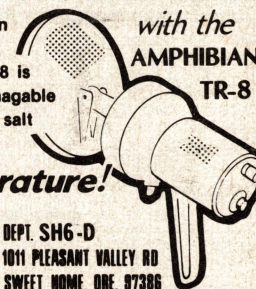
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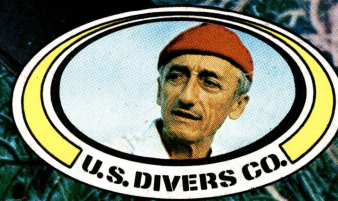
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